AMERICAN INSTITUTE OF CROP ECOLOGY

ECOLOGICAL CROP GEOGRAPHY AND FIELD PRACTICES OF JAPAN
JAPAN'S NATURAL VEGETATION AND AGROCLIMATIC ANALOGUES IN NORTH AMERICA

BY

M. J. KUCHARIK

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By

M. Y. NUTTONSON

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INTRODUCTION

The study of Japan is one of a number of studies dealing with North American agro-climatic analogues for the various countries of the world published by the American Institute of Crop Ecology. The purpose is to formulate an agronomic and horticultural approach to ecology and to promote research along the lines of crop ecology as it affects plant adaptation, plant introduction, and the exchange of varietal plant material among the various agricultural areas of the world.

These agro-climatic studies represent an outgrowth of problems of postwar plant-introduction tasks brought about by the urgent need of speedy rehabilitation of the war-devastated agricultural areas. Immediate utilization of the introduced plant material often precludes its careful testing through the usual varietal field trials, and hence caution cannot be over-emphasized in the selection of such material at its source.

The background of these studies was developed from experiences in non-emergency plant introduction where careful varietal field trials of introduced plant material were possible. From a purely regional point of view there is often a need for crop diversification and improvement as well as for economy of time, effort, and cost of the varietal field trials. A rational selection of agro-analogous areas for plant sources as well as careful selection of areas for field trials of a given plant material, the agro-climatic origin of which is known, may save considerable time and effort. It is fully appreciated that the elasticity of adaptation of a given plant variety is in no way limited or predetermined by the agro-climatic or ecological characteristic of its place of origin or discovery. It is also appreciated that often completely different and strange environmental conditions may permit a variety to perform better or worse than or just as well as in its original environment, and that this can be ascertained by empirical tests. It is felt, however, that where a purely regional point of view prevails and where results are needed but economic considerations of securing such data do not permit large scale experimentation, an orientation on agro-climatic origin of the plants may be desirable.

The author wishes to acknowledge his gratitude to Lt. Col. Hubert G. Schenck, Chief, Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, Japan, without whose generous cooperation and guidance this study would not have been possible. Grateful appreciation for assistance is offered to the staff members of the Agriculture and of the Forestry Divisions of the Natural Resources Section. Acknowledgement is made also to the officials of the Ministry of Agriculture and Forestry and of the national and agricultural experiment stations of Japan for their kind hospitality and friendly assistance throughout the author's stay in Japan. Credit for organizing and editing material used is due Elizabeth A. Kendall and Irma F. Pittman of the Institute.

OBJECTIVE AND METHOD OF PROCEDURE

The objective of this study is to organize, define, and analyze the various distinct agro-climatic conditions prevailing in the different parts of Japan and to compare them with various agro-climatic regions of North America in order to ascertain climatic or thermal analogues. Climatic or thermal analogues are areas that are sufficiently alike with respect to some of the major weather characteristics affecting crop production, particularly during the growing period, to offer a fair chance for the success of plant material transplanted from one area to its climatic counterpart.

Meteorological data available from weather stations of Japan and from comparable stations of North America have been utilized as the basic source material for this study. Elements of comparison are the mean monthly and yearly temperatures, maximum and minimum temperatures, average monthly, seasonal and yearly precipitation and relative humidity, precipitation-effectivity indexes and ratios (Thornthwaite's method), length of frostless periods, and latitudes.

After such elements of environment of a given meteorological station in Japan had been computed and studied, a search was made among North American meteorological stations for a similar climatic and latitudinal environment. The environment in North America found to resemble most closely that of a given meteorological station in Japan was recorded as climatically or thermally analogous to it. In addition to the year-round climatic analogues, separate studies were made for the April-through-September and October-through-April fractions of the year to ascertain supplementary climatic or thermal analogues for the spring-planted and fall-planted crops. A map of Japan showing the elevations of the country, the meteorological stations, and the states and provinces of their North American climatic counterparts is included in this study. A complete listing of the year-round climatically or thermally analogous North American areas and their exact locations as well as some of the points in which they differ from their respective "opposite numbers" in Japan is given in the agro-climatic chart of this study. For convenience, these year-round analogues are listed also along with North American spring-crop and winter-crop thermal analogues of Japan in Table XVIII.

JAPAN: GENERAL AND COMPARATIVE GEOGRAPHY

Japan, a predominantly mountainous and hilly island country in the North Pacific Ocean, stretches in a southwest-northeast direction off the east coast of Asia. Its four major islands—Hokkaido in the north, Honshu in the middle, Shikoku in the southeast, and Kyushu in the south—cover a total north-south airline distance of nearly 1,150 miles and extend, in all, from approximately the 31st parallel north latitude to somewhat above the 45th parallel. With the southern chain of the small Ryukyu Islands,[1] the latitudinal range of Japan is extended over 700 miles farther south and covers thus a total of about 20 degrees of latitude, that is, from approximately 24° to 45° N.

A latitudinal comparison of Japan and certain parts of North America reveals that the northernmost part of Japan lies in the latitude of some areas of central Nova Scotia, southern New Brunswick and Maine, northern New Hampshire, Vermont and New York, southern Quebec and Ontario, northern Michigan and Wisconsin, southern Minnesota, northern South Dakota, southern Montana, central Idaho, and northern Oregon.

Similarly, southernmost points of Japan near the 31st parallel lie in latitudes approximately those of some areas of northern Florida, southern Georgia, Alabama, Mississippi, Louisiana, and Texas. The 31st parallel also cuts across northern Mexico, while the 24th parallel, that of the southernmost end of the Ryukyu Islands, runs south of the Florida Keys, and through central Mexico and the southern parts of the peninsula of Lower California.

Within the boundaries of the four major islands and their adjacent minor islands, Japan occupies an area of approximately 148,000 square miles, which is somewhat less than the land area of California and somewhat more than that of the combined territory of North Carolina, South Carolina, and Georgia.

The island of Honshu, also known as Hondo, is largest of the four major islands and is often referred to as the mainland of Japan. Occupying a central position between the northernmost and southernmost islands, Honshu is divided into three regions, northern, central and southwestern, at times referred to as Northern Japan, Central Japan, and Southern Japan. The total length of the island is about 800 miles and its area is nearly 90,000 square miles. The island of Hokkaido, also known as Yezo, bordered by the Sea of Japan, Sea of Okhotsk, and Pacific Ocean, is the northernmost of the four major islands and second largest in size. It is about 350 miles long and occupies an area of slightly over 34,000 square miles. The island of Kyushu, the southernmost of the four major islands, extends about 200 miles in length and occupies an area of approximately 16,000 square miles. The island of Shikoku, the smallest of

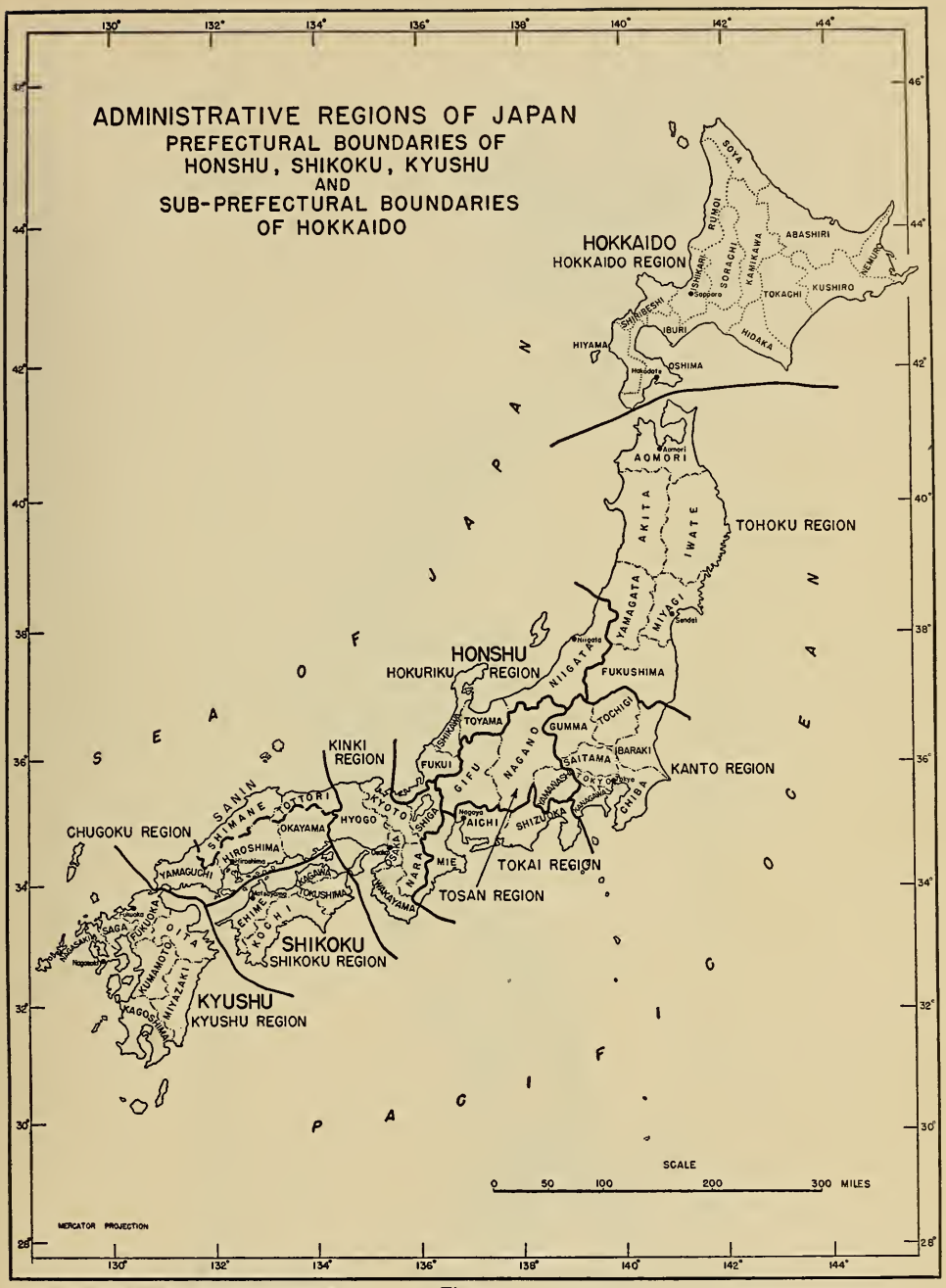
[1] The Ryukyu Islands will be covered in a future study.

the four islands, extends about 135 miles in length and occupies an area of slightly more than 7,000 square miles. The Ryukyu Islands, composed of 140 islands or islets and innumerable rocks and reefs scattered a distance of almost 775 miles, cover a total land area of 1,850 square miles. The administrative or political division of the four major islands of Japan into regions, prefectures, and—in the case of Hokkaido—into sub-prefectures can be seen in Figure 1 of this study.

The archipelago of Japan—a land of many volcanoes and earthquakes—faces the Western Pacific on the east, the Sea of Okhotsk on the north, the Sea of Japan and the East China Sea on the west and encloses the sheltered and peaceful Inland Sea, which connects with the Pacific as well as with the Sea of Japan and separates Honshu, Shikoku, and Kyushu from each other. Traversed by north-south mountain ranges, forming as it were a backbone, with numerous lateral branches, the four major islands of Japan present a highly complex and diverse landscape of a predominantly rugged mountain and hill country. Thickly wooded high mountains and dissected plateaus, sharp, deep canyons and valleys, hillsides clothed in rich, colorful vegetation, and intensively cultivated coastal plains, river valleys and deltas, mountain basins and terraces—all are a part of the landscape of this abundantly watered country. Swift mountain streams and rivers, scenic lakes, channels, straits, bays, and a great number of adjacent small islands are some of the additional landscape features of Japan.

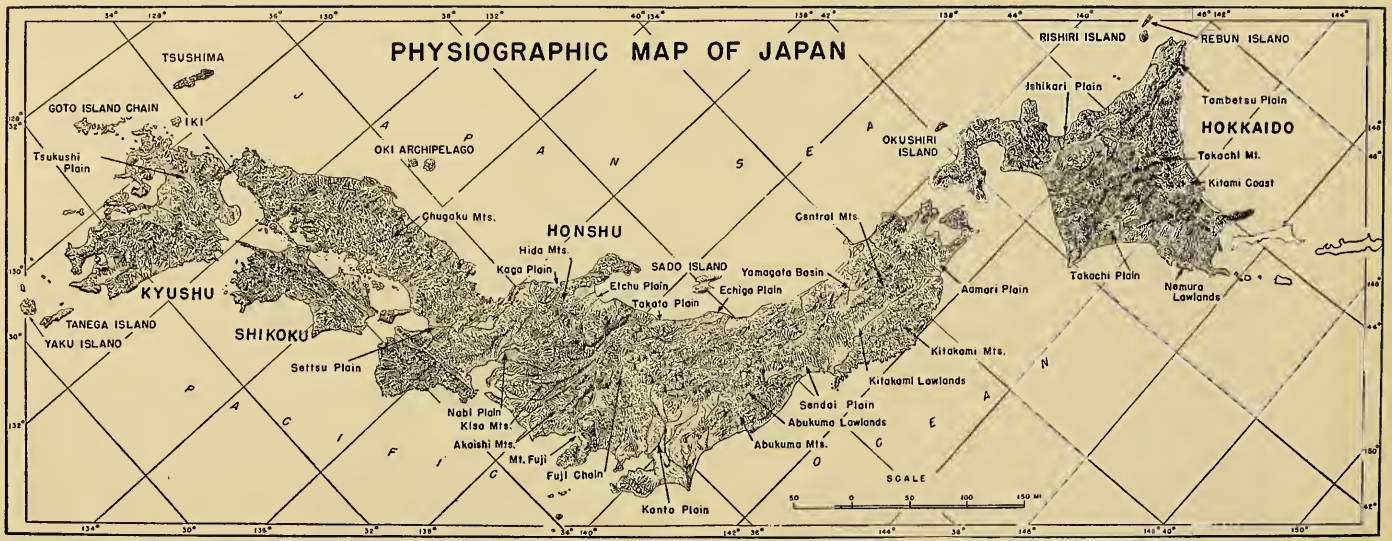
Much of the substratum of the islands of Japan consists principally of granite and traprock. Large areas are underlain by shale, sandstone, and limestone. Many valleys and plains contain large deposits of sand gravel, clay cobbles, and similar unconsolidated material brought down by the rapidly flowing mountain streams.

Over one-half of the total land area of the country is covered with luxuriant forests of a great diversity of broadleaved and coniferous species and of dense undergrowth. These forests are found largely in the mountainous regions, as more than three-fourths of the country's land consists of rough and rugged mountains and hills topographically unsuitable for cultivation of farm crops. The most imposing mountain ranges as well as the most extensive plains of the country are found in Honshu. The highest mountain peak of the country, Fuji-san (Fuji-yama), reaching an elevation of over 12,350 feet, and also many mountain peaks exceeding 9,000 feet elevation are found in central Honshu, the region of the famous, rugged Japanese Alps. The Kanto or Tokyo Plain, the largest plain and most important agricultural region of the country, several thousand square miles in area, is also found on the island of Honshu. There are a number of other fairly large plains in Japan which range from 500 to 800 square miles in area, but most of the plains and lowlands are rather small in size, and the total lowland area of the country is relatively limited. More-



Source: Natural Resources Section GHQ SCAP

Figure 1



Source: Based on Data from Natural Resources Section GHQ SCAP

Figure 2

over, some of the lowlands consist of unreclaimed coastal marshes and stony river beds unsuitable for cultivation.

The difficult terrain of this largely rugged mountain-and-hill country (Figure 2) is reflected in the rather limited arable land area of Japan. Notwithstanding the relatively favorable agro-climatic conditions prevailing over most of the country and the tremendous population pressure, less than one-sixth of the land area of the islands is under cultivation. This means an area of approximately 24,500 square miles, which in terms of the United States is more or less equal to the combined total harvested acreage of the states of Virginia, North Carolina, and South Carolina. The scarcity of agricultural land and the economic implications of this condition can be perceived most clearly in the plight of the farmer who, through extremely intensive and arduous field practices, often is forced to eke out a living for himself and his family from the production of grain on a farm unit averaging less than two acres of cultivated land. It should be noted that the relatively high total food production from the limited arable land area of Japan is made possible largely through extensive use and heavy application of fertilizers on a soil that is for the most part poor in natural fertility, through careful control of widespread plant diseases and insect pests, through use of improved crop varieties, through practice of multiple-cropping, and through careful irrigation in the case of rice, the most important crop of the country.

No proper understanding of the agricultural production problems and potentialities of this densely populated land of mountains and small alluvial plains can be gained without a thorough and intimate knowledge of Japan's climatic and soil conditions, its economic setting, the food habits and traditions of its people, their source of food, and the field practices and agricultural pattern followed in the country. These subjects are too complex to treat here in detail, and for some only a relatively brief outline will be presented.

CLIMATE OF JAPAN

The climatological charts included in this study give detailed meteorological data of a large number of the weather stations of Japan, covering long periods of time and reflecting the various conditions of the different climatic zones of the country. The map indicates the actual geographic distribution of the Japanese weather stations, the data of which have been utilized in this study.

Proximity to the Pacific Ocean, Sea of Okhotsk, Sea of Japan, East China Sea and to the Inland Sea, latitude, elevation, and general relief characteristics such as mountain barriers, land depressions, mountain shelters, and exposure are salient features of the various regions of Japan which are matched by a considerable diversity of climatic conditions. Notwithstanding the pronounced regional differences, and the numerous microclimatic variations in some of the individual regions of the country, a number of broad climatic features prevailing in most of Japan suggest a certain unity of climate. Situated between the Pacific Ocean and the great land mass of Eurasia, from which it is separated by the Sea of Japan, this country has a climate largely determined by the prevalence of the monsoons. These monsoons constitute the major and the most dominant unifying climatic feature of Japan: the land area is exposed to alternate influences of moisture-laden, warm, southeastern sea-breezes in summer and of raw, cold, northwestern winds in winter. As reflected by meteorological data the broad unifying characteristics of the major regions of Japan appear to be: the abundance of precipitation throughout the year; the predominantly summer-maximum precipitation distribution pattern; the high relative humidity; the high summer temperatures; the hot, humid, sultry summers typical of most of Japan, except in the higher altitudes and latitudes; and the generally favorable agro-climatic conditions.

The oppressively hot summers of most of the country, the cold winters of the north, and the raw, chilling winters of the middle and southern latitudes, as well as the wide range of annual temperatures suggest that the islands of Japan are subject to rather noticeable continental climatic influences despite their being surrounded by the sea.

The northwest winds of the winter monsoons sometimes blow continuously for many days at a time and are usually stronger during the daytime than at night. Along the western coast, that is, on the side facing the Sea of Japan, these cold, strong winds are often accompanied by heavy snowstorms and cold dismal weather. This is also true of the Pacific coast of Hokkaido and of northern Honshu, while on the eastern coast of central Honshu and all other Pacific areas south of it, the strong winds of the winter monsoon usually bring no snowstorms. The southeastern breezes of the summer monsoon, which bring most of the warm


FROST FREE SEASON
APPROXIMATE NORTHERN LIMITS
OF SEVERAL
COMMERCIALLY CULTIVATED CROPS
NOTE: Figures represent number of days between overage dates of last spring frost and first autumn frost (hoar frost). In Japan "in most cases hoar frost is associated with killing frost, or low temperature which is destructive to vegetation" (T Okada, "Climate of Japan," P 141)
LIMIT OF RICE
HOKKAIDO
LIMIT OF MULBERRY
LIMIT OF SWEET POTATO
LIMIT OF TOBACCO
LIMIT OF TEA
LIMIT OF WINTER CROPS IN PADDY FIELDS
LIMIT OF ORANGE
HONSHU
LIMIT OF TWO CROPS OF RICE DURING YEAR
SHIKOKU
KYUSHU
SCALE
0 50 100 200 MI

Source: Natural Resources Section GHQ SCAP

Figure 3

AVERAGE DATES OF FIRST AND LAST KILLING FROST, AND AVERAGE DURATION OF FROSTLESS PERIOD, IN PREFECTURES

PREFECTURE	FIRST FROST	LAST FROST	NUMBER OF FROST-FREE DAYS	RANK*
Hokkaido	Oct. 4	May 20	137	38
Aomori	Oct. 28	May 5	176	33
Iwate	Oct. 26	May 1	178	32
Miyagi	Nov. 3	Apr. 21	196	28
Akita	Oct. 24	Apr. 29	168	35
Yamagata	Oct. 21	May 8	166	36
Fukushima	Oct. 26	May 3	176	33
Ibaraki	Nov. 1	Apr. 26	157	37
Tochigi	Oct. 27	May 1	179	31
Gumma	Nov. 9	Apr. 12	211	20
Saitama	Nov. 5	Apr. 16	203	24
Chiba	Nov. 27	Mar. 27	241	8
Tokyo	Nov. 13	Apr. 7	220	13
Kanagawa	Nov. 26	Mar. 26	215	16
Niigata	Nov. 22	Apr. 9	227	11
Toyama	Nov. 14	Apr. 16	212	19
Ishikawa	Nov. 17	Apr. 16	215	16
Fukui	Nov. 13	Apr. 20	207	21
Yamanashi	Oct. 31	Apr. 22	191	29
Nagano	Oct. 27	May 5	175	34
Gifu	Nov. 2	Apr. 19	197	27
Shizuoka	Dec. 7	Mar. 4	278	1
Aichi	Nov. 6	Apr. 14	206	22
Mie	Nov. 16	Apr. 8	218	14
Shiga	Nov. 8	Apr. 22	200	25
Kyoto	Nov. 1	May 1	183	30
Osaka	Nov. 13	Apr. 9	218	14
Hyogo	Dec. 1	Mar. 29	247	4
Nara	Nov. 7	Apr. 22	199	26
Wakayama	Dec. 7	Mar. 27	254	2
Tottori	Nov. 13	Apr. 23	204	23
Shimane	Dec. 4	Apr. 11	237	9
Okayama	Nov. 8	Apr. 16	206	22
Hiroshima	Nov. 17	Apr. 7	224	12
Yamaguchi	Dec. 2	Mar. 28	249	3
Tokushima	Nov. 25	Apr. 5	234	10
Kagawa	Nov. 14	Apr. 14	214	17
Ehime	Nov. 28	Apr. 3	215	16
Kochi	Nov. 23	Mar. 26	242	7
Fukuoka	Nov. 10	Apr. 19	213	18
Saga	Nov. 13	Apr. 10	217	15
Nagasaki	Nov. 23	Mar. 24	244	6
Kumamoto	Nov. 6	Apr. 13	207	21
Oita	Nov. 26	Mar. 31	241	8
Miyazaki	Nov. 21	Mar. 25	241	8
Kagoshima	Nov. 24	Mar. 24	245	5

* Ranging from 1 meaning longest frostless period to 38 meaning shortest frostless period.

SOURCE: *Based on Data from Ministry of Agriculture and Forestry, Japan.*

Figure 3 (Cont'd)

season precipitation to the country, are considerably weaker in strength and of shorter duration than are the winds of the winter monsoon. Cyclones, anticyclones and typhoons (tropical cyclones) are also among the important factors in Japan's overabundant precipitation and they often leave in their wake violent storms, torrential rains and floods.

Although the summer-maximum precipitation is characteristic of the greater part of the country, it will be seen from the agro-climatological chart that there are some areas where winter is the wettest season of the year, and that the major winter-maximum precipitation areas are found on the coast of the Sea of Japan. It will be seen also that for the greatest part of Japan the highest precipitation occurs during early and late summer and the maximum monthly totals are found during September. The actual yearly totals of precipitation vary greatly (Figure 4) and range from 33 inches in northern Hokkaido to 200 inches in the high mountain region of southern Honshu. August is generally the month of the highest mean temperature and January the month of the lowest mean. There are a few areas, however, where February rather than January is the coldest month of the year. The January mean temperature for most of Japan ranges from 14° F. in northern Hokkaido to above 46° F. in southern Kyushu, while the August mean temperature ranges from about 62° F. in northern Hokkaido and in some of the cool high mountain areas of Honshu to above 82° F. in the warmer parts of the country. The duration of the average frostless period for Japan as a whole ranges from about 120 days to over 300 days (Figure 3).

The meteorological data of most of the weather stations of the western coastal areas of Japan (Table I) suggest a heavier January precipitation, a larger total yearly precipitation, higher temperature means for April and August and a higher yearly mean temperature than those of their latitudinal and altitudinal counterparts on the eastern coast.

Precipitation in September (the month of heaviest precipitation throughout much of the country) for the most part is higher on the western coast than on the eastern coast, but often is lower and occasionally similar in magnitude. While January precipitation as recorded at weather stations on the Pacific coast is consistently smaller than that of September, such is not always the case at weather stations on the Sea of Japan side, where there are a few areas in which January precipitation totals exceed those of September. The temperature means for January and October appear to vary and to show no consistent trend.

In other words, most of the coastal areas of the Sea of Japan side are subject to more precipitation, especially during the wintertime, and to greater warmth in the spring and summer than their corresponding areas on the Pacific coast. The winters and autumns, on the other hand, are not always warmer and the rainfall during the summer and early fall season is not necessarily always greater on the western coast.

TABLE I

A CLIMATIC COMPARISON OF SOME EASTERN AND WESTERN COASTAL AREAS OF JAPAN

(Arranged in Pairs of Localities of Similar Latitudes and Altitudes)

COAST	ISLAND	METEORO-LOGICAL STATION	Station Reference Number*	Latitude (N.)	Altitude (Feet)	MEAN TEMPERATURES (°F.)					AVERAGE PRECIPITATION (INCHES)		
						January	April	August	October	Yearly	January	September	Annual
Sea of Japan	Hokkaido	Haboro	4	44° 23′	69	21.0	39.9	69.3	51.3	44.4	3.8	6.1	48.9
Okhotsk Sea	"	Abashiri	1	44° 01′	128	19.4	37.9	66.7	49.8	42.3	2.7	4.7	33.7
Sea of Japan	"	Sapporo	10	43° 04′	56	20.8	41.4	70.0	49.6	44.8	3.8	5.2	42.4
Pacific Ocean	"	Nemuro	8	43° 20′	88	22.8	36.9	62.8	51.4	41.9	1.6	5.8	40.0
Sea of Japan	"	Suttsu	11	42° 48′	55	26.2	42.1	69.8	52.9	46.4	5.0	6.2	49.5
Pacific Ocean	"	Kushiro	6	42° 59′	111	19.8	37.0	64.0	49.5	41.4	2.0	6.0	43.1
Sea of Japan	Honshu	Akita	20	39° 43′	33	29.3	46.6	75.0	55.0	50.7	5.2	7.9	70.5
Pacific Ocean	"	Miyako	15	39° 38′	100	30.6	46.6	72.0	55.0	50.2	2.3	8.5	52.3
Sea of Japan	"	Aikawa	55	38° 02′	148	36.0	50.0	77.9	60.8	55.2	5.2	6.7	61.3
Pacific Ocean	"	Ishinomaki	18	38° 26′	148	31.1	47.3	73.9	56.8	51.4	1.6	6.4	44.5
Sea of Japan	"	Takada	58	37° 06′	49	33.3	50.0	79.2	58.8	54.7	17.5	8.4	112.3
Pacific Ocean	"	Onahama	27	36° 56′	20	36.3	50.4	74.5	59.5	54.3	1.7	8.9	61.1
Sea of Japan	"	Fukui	62	36° 03′	35	36.6	52.9	78.6	59.4	56.1	11.1	9.1	95.1
Pacific Ocean	"	Mito	31	36° 23′	102	35.6	52.0	75.7	59.2	54.9	2.1	8.5	58.9
Sea of Japan	"	Miyazu	91	35° 32′	9	37.9	52.7	78.6	60.6	56.8	8.3	9.3	78.7
Pacific Ocean	"	Katsuura	45	35° 09′	44	41.9	56.8	78.1	63.9	59.4	2.4	8.3	60.9
Sea of Japan	"	Hamada	108	34° 54′	65	41.0	53.8	78.3	61.2	58.1	4.0	8.9	64.4
Pacific Ocean	"	Nagatsuro	78	34° 36′	194	45.0	57.6	78.3	65.8	60.8	1.7	8.2	55.5
E. China Sea	Kyushu	Nagasaki	138	32° 44′	340	41.7	56.8	79.5	64.0	59.9	2.7	10.9	76.2
Pacific Ocean	Shikoku	Ashizurizaki	131	32° 44′	213	45.9	60.1	80.2	67.5	62.8	2.2	14.0	85.2

* Refers to station reference number in Agro-Climatological Chart of this study.

TABLE II

A CLIMATIC COMPARISON OF SOME HONSHU AREAS OF DIFFERENT ELEVATION BUT OF SIMILAR LATITUDE

METEOROLOGICAL STATION	Station Reference Number*	Latitude (N.)	Altitude (Feet)	MEAN TEMPERATURES (°F.) January	August	Yearly	Average Annual Precipitation (Inches)
Sakai	105	35° 33′	9	38.7	79.0	57.6	77.1
Maizuru	90	35° 29′	102	37.8	78.1	56.7	81.1
Tokorozawa	41	35° 48′	236	34.5	76.8	55.2	62.4
Ome	50	35° 47′	666	34.5	75.2	54.5	74.6
Chichibu	38	35° 59′	794	33.1	76.1	54.7	70.2
Gotemba	75	35° 18′	1,300	36.6	75.2	55.0	97.5
Iida	67	35° 31′	1,587	31.8	75.2	53.2	65.2
Ochiai (Kai)	65	35° 48′	3,687	24.8	66.0	45.3	73.9
Ibukisan	87	35° 25′	4,514	19.9	64.0	41.7	92.1

* Refers to station reference number in Agro-Climatological Chart of this study.

TABLE III

A CLIMATIC COMPARISON OF SOME LOW ELEVATION AREAS OF DIFFERENT LATITUDES ALONG THE WEST COAST OF JAPAN

ISLAND	METEOROLOGICAL STATION	Station Reference Number*	Latitude (N.)	Altitude (Feet)	MEAN TEMPERATURES (°F.) January	August	Yearly	Average Annual Precipitation (Inches)
Hokkaido	Haboro	4	44° 23′	69	21.0	69.3	44.4	48.9
"	Sapporo	10	43° 04′	56	20.8	70.0	44.8	42.4
"	Suttsu	11	42° 48′	55	26.2	69.8	46.4	49.5
Honshu	Akita	20	39° 43′	33	29.3	75.0	50.7	70.5
"	Aikawa	55	38° 02′	148	36.0	77.9	55.2	61.3
"	Takada	58	37° 06′	49	33.3	79.2	54.7	112.3
"	Fukui	62	36° 03′	35	36.6	78.6	56.1	95.1
"	Miyazu	91	35° 32′	9	37.9	78.6	56.8	78.7
"	Hamada	108	34° 54′	65	41.0	78.3	58.1	64.4
Kyushu	Sasebo	139	33° 10′	48	42.4	81.0	60.6	77.3
"	Nagasaki	138	32° 44′	340	41.7	79.5	59.9	76.2
"	Makurazaki	147	31° 16′	112	46.2	80.4	62.6	72.6

* Refers to station reference number in Agro-Climatological Chart of this study.

TABLE IV

A CLIMATIC COMPARISON OF SOME LOW ELEVATION AREAS OF DIFFERENT LATITUDES ALONG THE PACIFIC COAST OF JAPAN

ISLAND	METEOROLOGICAL STATION	Station Reference Number*	Latitude (N.)	Altitude (Feet)	MEAN TEMPERATURES (°F.) January	August	Yearly	Average Annual Precipitation (Inches)
Hokkaido	Nemuro	8	43° 20′	88	22.8	62.8	41.9	40.0
"	Kushiro	6	42° 59′	111	19.8	64.0	41.4	43.1
"	Erimo	3	41° 55′	210	27.0	64.9	44.6	34.0
Honshu	Miyako	15	39° 38′	100	30.6	72.0	50.2	52.3
"	Ishinomaki	18	38° 26′	148	31.1	73.9	51.4	44.5
"	Onahama	27	36° 56′	20	36.3	74.5	54.3	61.1
"	Mito	31	36° 23′	102	35.6	75.7	54.9	58.9
"	Katsuura	45	35° 09′	44	41.9	78.1	59.4	60.9
"	Nagatsuro	78	34° 36′	194	45.0	78.3	60.8	55.5
Shikoku	Ashizurizaki	131	32° 44′	213	45.9	80.2	62.8	85.2
Kyushu	Miyazaki	145	31° 55′	27	44.4	79.9	61.7	100.3

* Refers to station reference number in Agro-Climatological Chart of this study.

It will also be noted from Table I that although the April, August and annual mean temperatures of the weather stations of Japan located north of 36° N. latitude are lower on the Pacific coast than they are on their corresponding coastal areas of the Sea of Japan, such is not always the case with the more southern stations. Below 36° N. latitude the various seasons of the Pacific coast areas appear to be either warmer than or just as warm as those of the western coastal areas of similar latitude and elevation. One finds on the Pacific side below 36° N. that the annual mean temperature and also the mean temperatures for January, April and October are higher than those in the corresponding areas of the west. One also finds that the August temperatures of the Pacific coastal areas below 36° N. show no consistent trend and appear to differ little from those of their western counterparts.

The contrast between the country's northern Pacific areas, which are cooler during the summer than their corresponding areas on the coast of the Sea of Japan, and the more southern Pacific areas, which are just as warm as their western counterparts during the summer and considerably warmer during the rest of the year, appears to be related to the oceanic currents of the Pacific. The relatively cooler summers of the Pacific coastal areas north of the 36th parallel are probably the result of the cooling effect of the cold Okhotsk Current, which flows southward along the eastern coast of Japan down to approximately 36° N. latitude. Slightly below that parallel the cooling effect of the Okhotsk Current ceases as it encounters the warm waters of the Japanese Current which flows along the southeastern coast of the country. This warming effect of the Japanese Current probably explains also the fact that the spring, autumn and winter seasons of coastal regions of the Pacific side south of 36° N. latitude are distinctly warmer than their latitudinal and altitudinal counterparts along the coast of the Sea of Japan, since the western branch of the Japanese Current appears to have a limited effect on the western coast.

A comparison of weather data at representative stations located on the western coast of Japan (Table III) shows an increase of 25° F. in the January mean temperature from northern Hokkaido to southern Kyushu (44° 23′-31° 16′, a latitudinal distance of 13 degrees) and an increase of 11° F. in the August mean, suggesting a general trend for the Sea of Japan side of over twice as large a temperature gradient per degree of latitude during the coldest as during the warmest month of the year. Along the Pacific coast (Table IV), a similar comparison reveals an increase in the January mean of 25° F. and in the August mean of 13° F. within a latitudinal distance of 11 degrees (43° 20′-31° 55′). This suggests for the eastern coast a temperature gradient per degree of latitude almost twice as large during the coldest month as during the warmest.

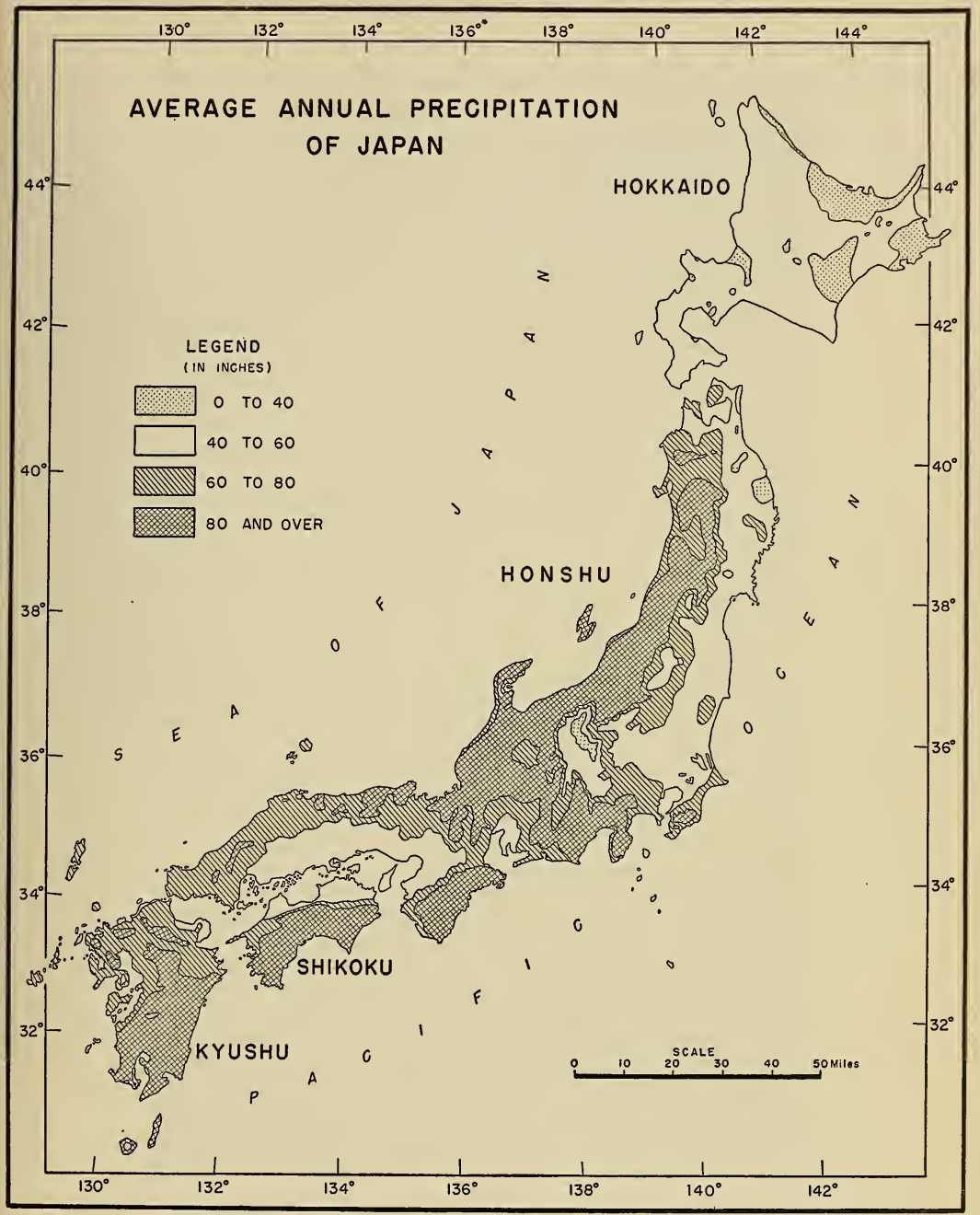
The amounts of annual precipitation do not suggest any definite and consistent pattern with the change of elevation. Although the maximum

amount of precipitation, as can be seen from the climatological chart and from Table II, is found in areas of higher altitude, this does not appear to imply that one always finds greater annual precipitation with greater elevation. The general and consistent tendency for the mean temperature, however, is to become lower with the rise in elevation. Differences in altitude appear to result in a pronounced vertical zonation of thermal conditions in Japan not unlike those of the horizontal zonation brought about by difference in latitude. A comparison of some of the data of Table II and Table III suggests that the 16°F. decrease in the yearly mean within a 4,500-foot increase in elevation (Table II) is rather similar to that brought about by an increase in 11 degrees of latitude (Table III), which number of degrees represents more than three-fourths of the total latitudinal range of the four major islands of Japan, a distance of more than a thousand miles from Kyushu in the south to Hokkaido in the north.

The data of Tables III and IV permit one to see the general effect of the difference of latitude on the mean temperature and the precipitation totals in the lowland coastal areas of western Japan and in the lowland coastal areas of eastern Japan along the Pacific. The precipitation data of these two tables suggest that although as a whole the larger annual precipitation totals are found in the more southern areas of the country, the mere decrease in latitude does not necessarily seem to imply a rise in the amount of precipitation. As can be seen in the precipitation column of these tables, there are quite a number of areas where, despite their higher latitudes, actual amount of precipitation is greater than in areas of considerably lower latitude.

Tropical and extratropical cyclonic disturbances and general local conditions of exposure to the prevailing and largely seasonal winds greatly influence the precipitation of Japan. Thus, the heaviest snowfalls usually accompany the deep extratropical cyclones of winter and the heaviest rainfalls occur during the passage of typhoons. High mountain barriers which surround some of the interior regions of Japan take much of the moisture from the passing winds so that they bring relatively little precipitation upon entering these regions. The same is true of the lee side or the mountain-sheltered coastal areas where the precipitation is much lighter than in the open coasts backed by high mountains which face the seasonal onshore winds. For most of the Japan Sea coast, as on the coasts backed by mountain ranges, the precipitation is heaviest during the seasonal onshore winds; the wettest season on the Sea of Japan coast coincides with the winter months of the northwest monsoon, while on the south and on the east coasts the wet season coincides with the summer months of the southeasterly monsoons.

Though climatic conditions vary in the different parts of the country, a large portion of the farming area of Japan is characterized by a long and warm growing season (Figure 3), rather well-distributed and ade-



Source: Based on Data from Natural Resources Section GHQ SCAP

Figure 4

quate precipitation (Figure 4), high humidity, and abundant ground water resources for irrigation purposes. As a whole, with the exception of Hokkaido and northern Honshu, the agro-climatic conditions prevailing over the country are conducive to vigorous and prolonged plant growth and to intensive crop production wherever topography and soil environment are favorable. The long growing season over much of Japan permits double-cropping, that is, more than one crop per year on the same land, and in some areas also multiple-cropping, the latter being especially true in the more southern parts of Japan.

While the basic climatic features as a whole are favorable for a high crop production per unit area and multiple-cropping over a considerable part of the farm land of Japan, localized but recurrent crop losses from severe winters, excessive rains and snow, floods, typhoons, and even occasional droughts constitute a major problem and at times even disaster. Thus, the severe winters of Hokkaido, which are long and cold, make difficult, if not impossible, the production of winter grain. Heaving of the soil, as a result of repeated freezing and thawing, frequently reduces the yield of winter grain in some areas of northern Honshu. Excessive precipitation, much of it during the harvest season, is characteristic of the Japan Sea coast. The heavy winter snow of the Japan Sea region does not melt until late in spring, and it provides favorable snow-blight conditions and renders difficult the winter grain production on the poorly drained soils of that region.

The typhoons, which sweep in from the southern Pacific, are almost a yearly occurence and constitute at times a major problem in regard to crop production on Honshu, Shikoku, and Kyushu. These tropical windstorms frequently come during the harvest season and are often accompanied by severe rainstorms of high intensity which bring in their wake destructive floods damaging to crops. Droughts, though rarely causing complete crop failures, may reduce yields in some sections of the islands despite the usually ample and fairly well distributed precipitation of Japan. The Naikai or Inland Sea region, where precipitation is usually lighter than in other regions of the islands of Honshu, Shikoku, and Kyushu, is particularly subject to droughts. It should be pointed out that occasionally there is a considerable anomalism in the precipitation of Japan, where many unusual deviations from the general and the expected go to make up a precipitation average or the accepted notion of the normal precipitation distribution pattern. Thus, to cite an extreme irregularity, the weather records of Toyko indicate that during the winter dry season —when one usually expects in the area on the average only about 6 rainy days per month—rain has been known to fall nearly daily for almost seven consecutive weeks. Similarly, the weather records of Osaka point to an exceptionally long rainless period of 43 consecutive days in the midst of what is normally the summer wet season, during which rainy days are usually expected to make up one-third of the season's total number of days.

Hokkaido

The climate of the northernmost of the four major islands of Japan, Hokkaido, is temperate, humid, and continental in character. The summers are fairly warm, with temperatures a little higher on the west coast than on the east coast. The winters are cold. The mean annual coastal temperature ranges between 47° F. at Hokodate (Station No. 5; 41° 17′ N.)[1] and 44° F. at Wakkanai (Station No. 13; 45° 25′ N.). The mean air temperature varies in different areas from 13° to 27° F. for the coldest month and from 62° to 70° F. for the warmest month. Sapporo (Station No. 10; 43° 04′ N.) is the most northerly point, according to record, at which the mean August temperature is as high as 70° F. At Abashiri (Station No. 1; 44°01′ N.) and at Nemuro (Station No. 8; 43°20′ N.) the mean August temperatures are 66° and 62° F., respectively. The January means of the three stations, in the foregoing order, are 21°, 19°, and 22° F., and during this month the central part of Hokkaido is surrounded by a mean isotherm of 15° F. Extreme minimum temperatures during winter and early spring may reach below zero. At Nemuro below-zero temperature has been recorded throughout the period from January to March, with the extreme low of —9° F. in January. Much lower temperatures are found in the inland areas of the island. Thus, an extreme January low of —41° F. has been recorded at Asahigawa (Station No. 2). Below freezing temperatures occur on Hokkaido from September through May. Along most of the coast, summer maximum temperatures of 90° F. or over are not uncommon, and in August a maximum temperature of 97° F. has been recorded at Abashiri on the north coast. On the extreme east of the island, at Nemuro, the maximum of 89° F. has been recorded during the month of July. The summer cloudiness of the east coast tends to reduce the extreme maximum temperatures there just as the winter cloudiness and the sea winds tend to increase the winter minimum temperatures on the west coast. The length of frost-free season is rather short and ranges throughout Hokkaido from 97 to slightly over 170 days.

The annual precipitation ranges in general from 33 to 50 inches, and practically all the precipitation from December to March is in the form of snow, which usually begins in Hokkaido in October and may fall until May. Heavy snow covers the island almost continuously from November to April, and the depth of snowcover for the island as a whole usually ranges between 12 and 20 inches, though 6 to 9 feet of snow depth is not uncommon in some localities, and buildings must be sheltered by special windbreaks. The number of days with snow ranges from 55 at Kushiro (Station No. 6; 42° 59′ N.) to 118 at Suttsu (Station No. 11; 42° 48′ N.) and to 131 at Asahigawa (Station No. 2; 43° 47′ N.). Cold southeast winds blow from Asia across the sea to western Japan, and winter blizzards pile

[1] For all station reference numbers see Agro-Climatological Chart and Meteorological Station Map of this study.

up great ice and snow drifts. Skis and sleds are common means of travel and transport during the long winters of Hokkaido.

Warm, moist summer winds, blowing northwest from the Pacific, cross the cold southward-flowing Okhotsk Current which has chilled the air mass, and this produces a fog belt along the eastern coast of Hokkaido, especially during June and July. Thus, the weather station of Nemuro in eastern Hokkaido reports 85 days of fog annually in contrast to Suttsu in western Hokkaido which reports only 5.

The transition between winter and summer is rather abrupt with a relatively short spring season. Frosts occur from early October until late May. During the growing season moderately strong winds often blow dust from volcanic ash and peat soils causing considerable crop damage in some of the agricultural areas where no extensive plantings of windbreaks have been provided.

Heavily wooded mountain ranges, interspersed with cultivated plains, traverse Hokkaido in a north-south direction and practically divide the island into eastern and western climatic zones which are often subject to different weather during any season of the year. The higher annual precipitation in the west is largely due to the greater amount of snowfall. The rainfall pattern is more or less similar throughout most of Hokkaido though the amounts of precipitation vary. Thus, the greatest monthly precipitation, 5 to 6 inches, falls on southern Hokkaido from July to October ,while in some areas of the west coast 4 to 6 inches of rainfall are recorded monthly from July to January. Local climatic variations, which are of considerable agricultural importance, have been utilized as a basis for formulating 25 distinct agro-ecological districts of Hokkaido as outlined in Figure 21.

Honshu

Honshu, the largest and the main island of Japan, is subject to a wide range of climatic conditions. These vary all the way from a humid continental type of climate in the north to a humid and nearly subtropical climate in some of the southern areas. Along the Japan Sea coast the mean annual temperatures vary from 48° F. at Aomori (Station No. 14) in the northern part of Honshu to 58° F. at Hamada (Station No. 108) on Tsushima Strait in the southern part of the island. At Hamada the August and January means are 78° and 41° F. while at Aomori the means of these months are 74° and 27° F. Along the Japan Sea coast of Honshu the annual precipitation totals vary considerably. Thus, the annual precipitation is 64 inches at Hamada (34°54′ N.) and 102 inches at Kanazawa (Station No. 60; 36°32′ N.) in the Hokuriku region south of the Noto Peninsula. Farther northward along the Sea of Japan coast of Honshu at Akita (Station No. 20; 39°43′ N.) the total annual precipitation is 70 inches. The period of maximum precipitation varies also considerably along the Japan Sea coast. Thus, in southwest Honshu, for example at

Hamada, June, July, and September are the months of maximum precipitation. The *bai-u* or "plum rains" (at plum ripening time) fall in early summer from about mid-June to mid-July and the typhoon rains come during September. The winter monsoon precipitation is the minimum precipitation period in southwestern Honshu, but less than one degree farther north along the coast at Sakai (Station No. 105; 35°33′ N.) the months of December and January constitute the second period of maximum precipitation, though September is the month of heaviest precipitation, with April, May, and August making up the months of least precipitation there. Still one degree further north along the Sea of Japan coast at Kanazawa the season of maximum precipitation is largely that of November to January, with the secondary maximum period of precipitation occurring during the month of September. Proceeding still further along the coast of the Sea of Japan about three degrees to the north of Kanazawa one finds that at Akita the period of maximum precipitation is spread from June to December.

The number of precipitation days during the winter monsoon wet season along the Sea of Japan coast is greater than at any other period of the year, even though the precipitation totals per day or per season may be smaller. Thus, at Niigata (Station No. 57) the average monthly precipitation total for January and for September is about the same—over 7 inches. However, this amount of precipitation requires a considerably greater number of rainy days during January than it does during September, namely, on the average 28 and 17 days, respectively. Along most of the Sea of Japan coast of Honshu there are more than 200 precipitation days annually. During the winter season the weather along the coast is often dismal and stormy and there is considerable snow. Thus, each year there are on the average about 30 days of snow at Hamada, 70 days at Niigata, and about 95 days at Akita. In the more northern areas of the Sea of Japan coast of Honshu severe blizzards of blinding snow are not infrequent. In the southern parts of the coast snowfall, which may begin in November and continue until April, alternates with rainfall. During January and February snow falls during one half of the precipitation days at Hamada. In the more northern parts of the western coast of Honshu snow may begin in October and practically all the precipitation from December to March consists of snow.

Along the whole Pacific coast of Honshu there are about 150 precipitation days as compared with the more than 200 precipitation days on the western coast. During the winter season, the eastern coast of Honshu is subject monthly to approximately 7 to 10 precipitation days as compared with the average 20 to 28 precipitation days during each winter month along the Japan Sea coast. During the summer the Pacific coast wet period and the Sea of Japan dry period have about the same number of precipitation days, that is, 14 to 17 days. The annual precipitation totals

of the Pacific coast range from 40 inches at Morioka (Station No. 17; 39°42′ N.) to over 97 inches at Gotemba (Station No. 75; 35°18′ N.). Snow occurs throughout most of the Pacific coastal area, and while days with snow average only from 6 to 15 days per year south of Fukushima Prefecture they may average more than 50 days north of it. In the northernmost Pacific areas of Honshu, that is, in Miyagi and Iwate Prefectures, the first snow sometimes falls during October, though usually not until November, and may continue until the month of April and, though snowfalls are much lighter than on the west coast, snowcover usually persists on the northeast coast of Honshu throughout the greater part of the winter.

The northern part of Honshu, extending from Aomori Prefecture in the north down through Niigata Prefecture along the western coast and through Fukushima Prefecture along the eastern coast, is subject to warm summers and cold winters. Climatic conditions vary with latitude, altitude, exposure, and position in reference to a given coastal area and its ocean currents. The Pacific coast of northern Honshu is washed by the same cold currents that run along the coast of Hokkaido. As a result, spring and summer winds blowing landward are cool, creating fogginess and overcast skies. Crop yields are at times reduced as a result of long periods of low temperature caused by continous cold winds. The frost-free growing season is affected in northern Honshu far more by differences in elevation and cold winds from the Pacific Ocean than by range in latitude. Along the eastern coast the mean annual temperature is 54° F. at Onahama (Station No. 27) in Fukushima Prefecture and 50° F. at Miyako (Station No. 15) in Iwate Prefecture, where the January mean drops to 30° F. Here the winter temperatures may descend below zero and freezing may occur from October to May. In many areas along the Pacific coast the summer maximum temperatures may rise to almost 100° F. The growing season along the northern half of the Pacific coastal area of northern Honshu ranges between 150 and 175 days, and along the southern half from 175 to 200 days. The higher levels of the Central Ranges, backbone of northern Honshu, have only 125 to 150 frost-free days, while Sadoshima, situated within the latitudinal range of northern Honshu and off its western coast in the Sea of Japan, has 200 to 225 frost-free days in its farm areas. The greater part of northwestern Honshu is subject to very raw and disagreeable winters, with heavy cloudiness, deep snows, and stormy weather, though the winter temperatures sometimes rise to between 60° and 70° F. In summer the weather is mostly pleasant, with occasional July and August high temperatures, but the extremes rarely reach 100° F. Along the entire Japan Sea coast the growing season is approximately 200 days.

The greatest precipitation of northern Honshu is found in the mountain areas of its western and southwestern parts. In some of its south-

western areas the annual precipitation total exceeds 120 inches, with the heaviest precipitation during the months of November, December, and January. On the Pacific side of northern Honshu the heaviest precipitation occurs largely during July, August, September, and October. Much of the precipitation along the Japan Sea and in the mountains is in the form of snow, which covers the ground 60 to 80 days in the lowlands near the southern border of northern Honshu and 100 to 120 days in the mountains and lowlands at the northern limits of Honshu. The snowfall is much lighter along the Pacific coast, and the snowcover duration is much shorter. As a result of prevalence of much clearer winter weather, the Pacific coastal areas are subject to warmer days and cooler nights than are the Japan Sea coastal areas. Thus the range in mean daily temperature is several degrees higher at Miyako on the Pacific coast than at Akita, its latitudinal counterpart on the Japan Sea coast. Typhoons that frequently cause considerable damage in northern Honshu sometimes occur during late summer and early fall.

The central part of Honshu, extending from Tochigi, Gumma, Nagano, Toyama, and Ishikawa Prefectures in the north down through Fukui, Gifu, and Mie Prefectures in the south, consists of coastal lowlands, intermountain basins, and high plateaus. The intermountain basins and high plateaus are subject to a local rather continental type of climate with relatively severe winters and warm, humid summers. The coastal lowlands are subject to fairly short and mild winters, moderately long, humid and warm summers; and within their generally warm-temperate type of climate there are a few nearly subtropical climatic areas.

Throughout central Honshu the annual temperature ranges from less than 43° F. in the higher elevations to over 62° F. in a limited area along the southernmost part of the Pacific coast.

At the lower elevations, which are of greatest interest to local agriculture, the mean annual temperature ranges between 55° F. and 62° F. The mean temperature of the coldest month ranges from about 24° F. (Oiwake, Station No. 71) to 45° F. (Nagatsuro, Station No. 78). The mean temperature of the warmest month ranges between 66° F. (Ochiai, Station No. 65) and 82° F. (Toba, Station No. 84). Marked altitudinal differences result in a variety of climates, and the growing season varies with elevation. The frost-free season lasts from 200 to 300 days on the Pacific side, up to 210 days in the lowlands of the Japan Sea side, from 157 to 174 days in the intermountain valleys, and only 125 days on some of the high plateaus of central Honshu.

The coastal lowlands embrace the great alluvial Kanto Plain which occupies the northernmost part of central Honshu. The mean annual temperature of the Kanto Plain region ranges from nearly 50° F. in the north to about 60° F. in the south. The mean August temperature is about 77° F. for the greater part of the region, though the actual range is

between 70° F. in the higher altitudes and 80° F. in the warmer lowland areas. Similarly, the January mean ranges between 30° F. and 40° F. in the higher and lower elevations of the region, respectively. The winters of the Kanto Plain are fairly cold, mostly dry and enjoy much sunshine. The summer heat, which is often rather oppressive, is considerably mitigated by the prevailing onshore and offshore breezes.

The Kanto Plain frost-free season extends from about mid-April to mid-November, while in the surrounding mountains the average duration of the frost-free season is from the beginning of May to mid-October. In the lowlands of the Kanto Plain the ground freezes (to shallow depth and for short periods) only in mid-winter, while in the adjacent mountain regions frosts persist from the latter part of October to the third week of April. The winter air temperatures of the Japan Sea coast of central Honshu are more or less similar to those found in areas of same latitude along the Pacific coast.

The highest annual precipitation totals of central Honshu are found in the mountains and the lowest in the intermountain basins. Throughout the various parts of the Kanto Plain the annual precipitation totals vary considerably, for example, 59 inches at Mito, having an elevation of 102 feet (Station No. 31) and 77 inches at Ashio having an elevation of 2,211 feet (Station No. 34). The Kanto Plain proper has lower annual precipitation totals than do its southern coastal areas and the higher surrounding mountains. Within the Kanto Plain, winter precipitation consists of gentle rains or of snows. On the lowland areas of the plain, snow remains on the ground for only a short period of time, while in the surrounding high mountains the snowcover persists throughout much of the winter. Summer precipitation of the Kanto Plain often consists of torrential rains, occasionally accompanied by thunderstorms. The total number of rainy days on the Kanto Plain ranges from 140 to 160 days, in addition to which there are from 140 to 150 cloudy days with no rain, leaving thus only 50 to 80 entirely clear days per year, most of which occur during the winter period. Along the Pacific coast of central Honshu there are usually two precipitation maxima, the first in June during the *bai-u* season and the second in the September-October period at the time of typhoons. Except for the June-July rainy season, when rainfall is plentiful, the driest period along the Japan Sea coast is during the growing season, as usually most of the annual precipitation occurs during the winter months. The Japan Sea coast is characterized by exceedingly heavy snowfalls. These heavy snowfalls are usually accompanied by strong winds and heavy clouds which make the winters there subject to less winter sunshine than the same season in other parts of Japan; and the heavy snowfalls bring the most uncomfortable, raw and penetrating weather despite the fact that the air temperatures are quite often not too low. Along the Sea of Japan, as well as in the high mountains, the heavy snowcover persists during most

of the winter, while along the Pacific coast the snowfall is light and stays on the ground for only a short period. Summer is the period of maximum precipitation in the intermountain basins and in the high mountains of central Honshu. The annual precipitation totals of the intermountain basins are often relatively small, being less than 50 inches, which is possibly the result of the effect of the high mountain ridges surrounding these basins on all sides. Winds vary in velocity and direction with the season. Typhoons occur in central Honshu from September to November and may cause great damage to crops and property.

The southwestern part of Honshu, bordered by Shiga, Kyoto, Hyogo and Okayama Prefectures in the north down through the southern end of the island, is subject to long, hot, humid summers, and to relatively mild-to-cool short winters. Local climatic conditions reflect variations in elevation, position, and proximity to seas or ocean, and within the generally predominating warm-temperate type of climate of this part of the island there are a few nearly subtropical climatic areas. The mean annual temperature of this region varies considerably and it is about 60° F. at the southern tip of Wakayama Prefecture along the Pacific coast, 58° F. in Shimane Prefecture near the Sea of Japan, also 58° F. in Hiroshima Prefecture along the Inland Sea, and about 42° F. in the higher areas of Nara Prefecture (Odaigaharayama, Station No. 97; elevation 5,141 feet). At the lower elevations, where most of agriculture is practiced, the mean annual temperature ranges between 57° and 59° F. The mean annual temperature is lower in the interior than in the coastal areas largely because of higher elevations. The length of the frost-free season ranges from about 185 days in some areas of Kyoto Prefecture to about 250 days in some parts of Hiroshima Prefecture and to 255 days in Wakayama. The mean annual precipitation varies greatly. It is lower along the Inland Sea than it is along the Japan Sea and in the mountains. Thus, along the Inland Sea the total annual precipitation may vary between 40 and 60 inches, along the Sea of Japan it may exceed 72 inches and in the mountains 120 inches. In the late fall and winter the cold winds blowing from Asia across the Sea of Japan bring much rain and snow and cause high humidity, cloudiness, and lack of sunshine during those seasons in the prefectures along the Japan Sea coast. The snowcover may total 8 inches in depth during February along the coast of the Japan Sea and 60 inches about 25 miles inland at an elevation of 1,650 feet. In the Inland Sea area the snowfall is light. Throughout southwestern Honshu typhoons which sometimes occur in late summer or early fall do great damage to crops and property.

Shikoku

The climate of Shikoku, the southeastern island of Japan, could be described as humid, warm-temperate to humid subtropical. With the

exception of the higher elevations where the temperatures are lower, the mean air temperature ranges chiefly from 40° to 46° F. during the coldest month and from 76° to 80° F. during the warmest month. The duration of the frost-free season is relatively long, ranging for the greater part of the island from over 200 to over 280 days. Winters are short and relatively mild but frost is common throughout the island. The comparatively long growing period on the southern coast of Shikoku in conjunction with ample precipitation and abundant sunshine permits the production of two crops of rice a year in some areas. This is especially true of the Kochi Plain, which is subject to the strong climatic influences of the warm currents of the ocean.

The average annual precipitation ranges from 45 to over 105 inches. South Shikoku is one of the wettest parts of Japan and its precipitation generally greatly exceeds that of the northern part of this island. The seasonal distribution of precipitation varies considerably. The highest precipitation occurs during the growing season, that is, during the seven months from April to October, and the lowest in late fall and winter. The total precipitation during June, July, and August is four times greater than that during December, January, and February. Snowfall is light and seldom remains on the ground for any length of time, even at the higher elevations. Typhoons, which sometimes occur in late summer, may damage crops and property.

Kyushu

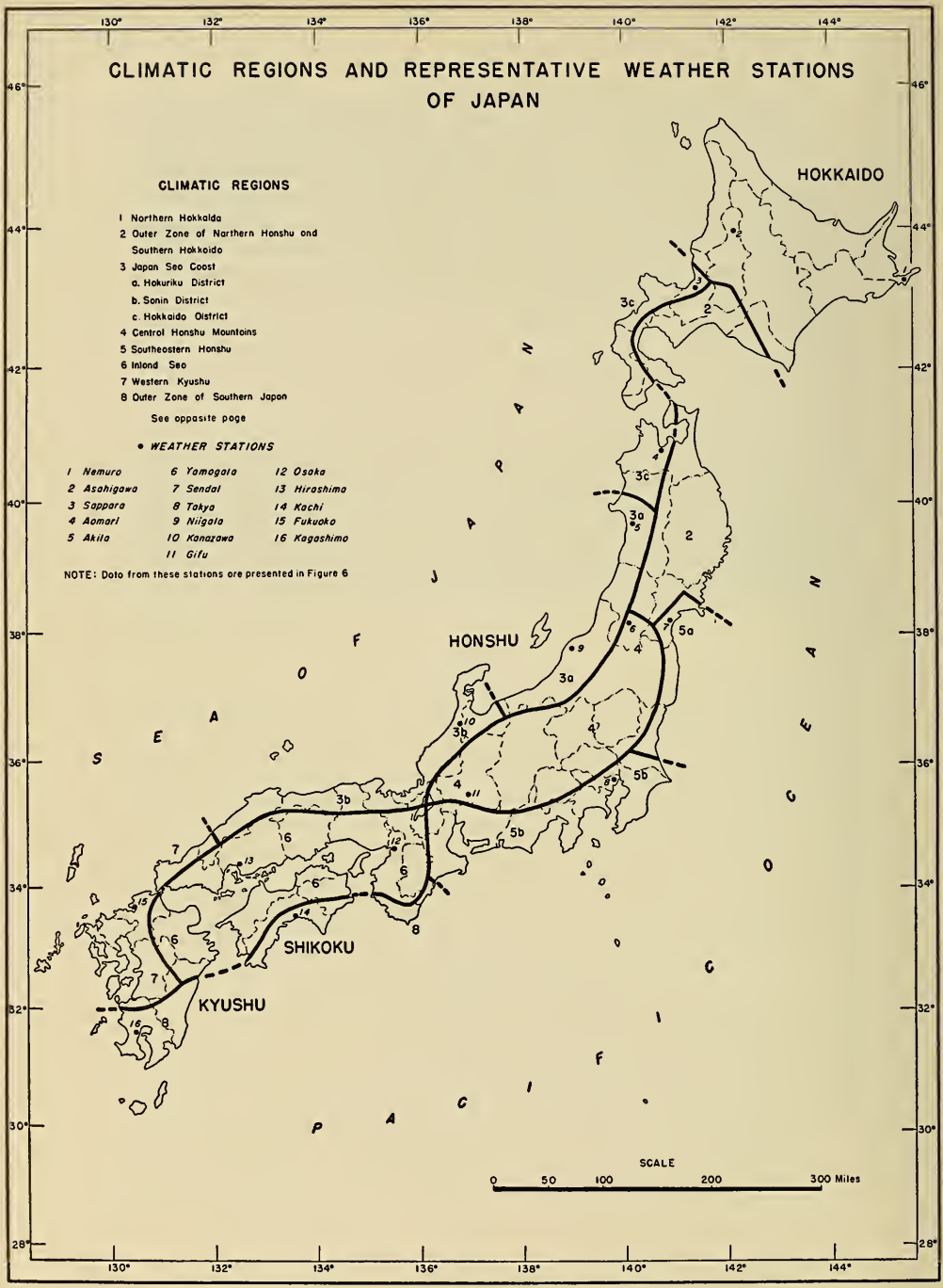
The climate of Kyushu, the southernmost island of Japan, is humid and could probably be described as warm-temperate to almost subtropical in its nature. The mean air temperatures vary in different areas and, with the exception of the higher altitudes, range from 41° to 46° F. during the coldest month and from 78° to 83° F. during the warmest month. In some of the higher elevations (for example Unzendake, Station No. 141) the means of the coldest and warmest months are 32° and 71° F., respectively. In summer, day temperatures frequently reach 95° F., while night temperatures seldom drop below 75° F. However, periods of intense heat are of rather short duration. The frost-free season is relatively long, ranging for the greater part of the island from 200 to 245 days. Frosts are common throughout the island.

The average annual precipitation ranges from 63 to 110 inches. Snowfall, although rather general, is light at lower elevations and remains on the ground only a short time, while in the mountain areas it is common throughout the winter. The distribution of rainfall is uneven and precipitation is much higher during the summer months than during the winter months, as can be seen from the precipitation totals of June, July, and August which are nearly four times as great as those of December, January, and February. In general, precipitation increases from January

to June, remains high through July, then, except for a secondary maximum in September, begins to decline. Monthly rainfall for June and July may range from 9 to 22 inches, while the precipitation of each winter month ranges from 2 to 5 inches. Fogs are infrequent on the island of Kyushu. The weather station of Kumamoto (Station No. 142) reports 17 days of fog annually which contrasts with only 5 foggy days at Saga (Station No. 136). Winds vary in direction and velocity with the season. Southeastern Kyushu is subject to autumn typhoons which often cause serious crop damage and occasionally destroy dikes, terraces, and other structures and buildings.

* * * * * * * * * *

The four major islands of Japan have been divided variously by different climatologists and geographers into a number of climatic regions. Figures 5 and 6 of this paper give a general outline and description of the climatic regions of Japan as formulated on the basis of some of these climatic divisions by the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, Tokyo, Japan.



Source: Natural Resources Section GHQ SCAP

Figure 5

DESCRIPTION OF CLIMATIC REGIONS

(See opposite page)

1. Northern Hokkaido

   Short, mild summers; long, cold winters. Frostless season 130 to 145 days; duration of snow cover may be 130 days or more. Annual precipitation 35 to 40 inches (850 to 1,000 mm).

2. Outer Zone of Northern Honshu and Southern Hokkaido

   Warm summers; cold winters. Frostless season approximately 170 days. Annual precipitation 40 to 60 inches (1,000 to 1,500 mm).

3. Japan Sea Coast

   Winter maximum of precipitation and cloud. Normal snow cover one foot (30.4 cm) or more. Annual precipitation 60 inches (1,500 mm) or more.

   a. Hokuriku District

      Heaviest snow accumulations of the region (3 feet [91.5 cm] or more). Warm summers; frostless season approximately 220 days.

   b. Sanin District

      Warm summers; moderate snow accumulations in winter. Frostless season approximately 220 days.

   c. Hokkaido District

      Moderate snow accumulations; cold winters. Mild summers; frostless season approximately 175 days.

4. Central Honshu Mountains

   Climates of localities differ according to altitude. Climate of intermontane basin is of continental type — cold winters, hot summers. Precipitation in valley basins approximately 40 to 50 inches (1,000 to 1,250 mm) annually, but higher on mountain slopes. Frostless season in basins 160 to 180 days.

5. Southeastern Honshu

   Warm summers; mild, relatively dry winters. Annual precipitation 60 to 90 inches (1,500 to 2,500 mm). Summer and autumn rainstorms may be heavy, especially those accompanying typhoons.

   a. Frostless season 180 to 200 days

   b. Frostless season 200 to 240 days

6. Inland Sea

   Hot summers; cool, relatively dry winters. Annual precipitation 45 to 75 inches (1,150 to 1,800 mm). Frostless season in lowlands approximately 220 days. Typhoons are experienced.

7. Western Kyushu

   Hot summers; mild winters. Annual precipitation 60 to 80 inches (1,500 to 2,000 mm). Frostless season approximately 200 to 220 days. Typhoons are experienced.

8. Outer Zone of Southern Japan

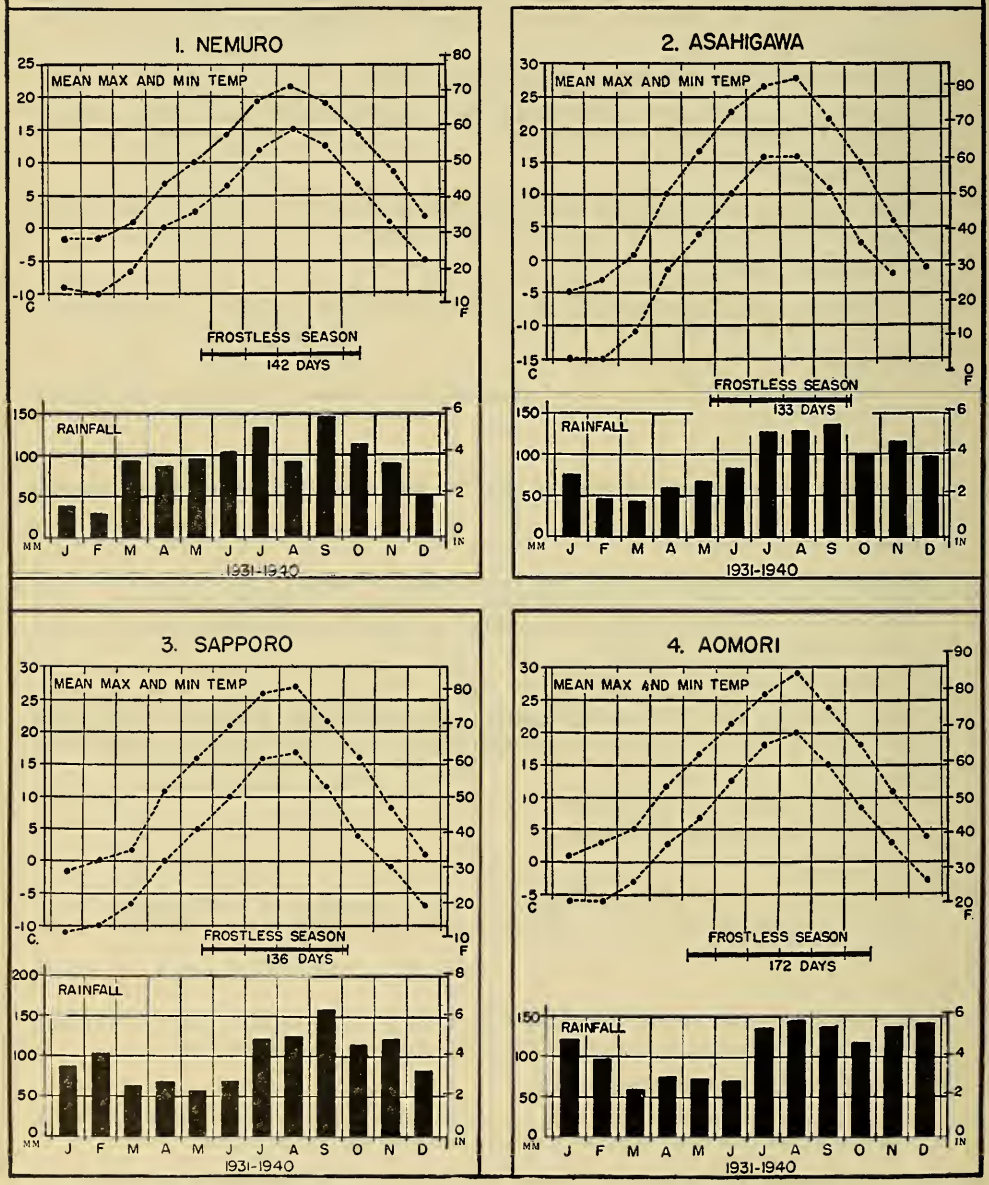
   Hot summers; very mild winters. Annual precipitation 80 to 120 inches (2,000 to 3,000 mm). Frostless season 240 days or more. Typhoon incidence highest in Japan.

Source: Natural Resources Section GHQ SCAP

Figure 5 (Cont'd)

AVERAGE MONTHLY TEMPERATURE, MONTHLY RAINFALL, AND FROSTLESS SEASON BY STATIONS

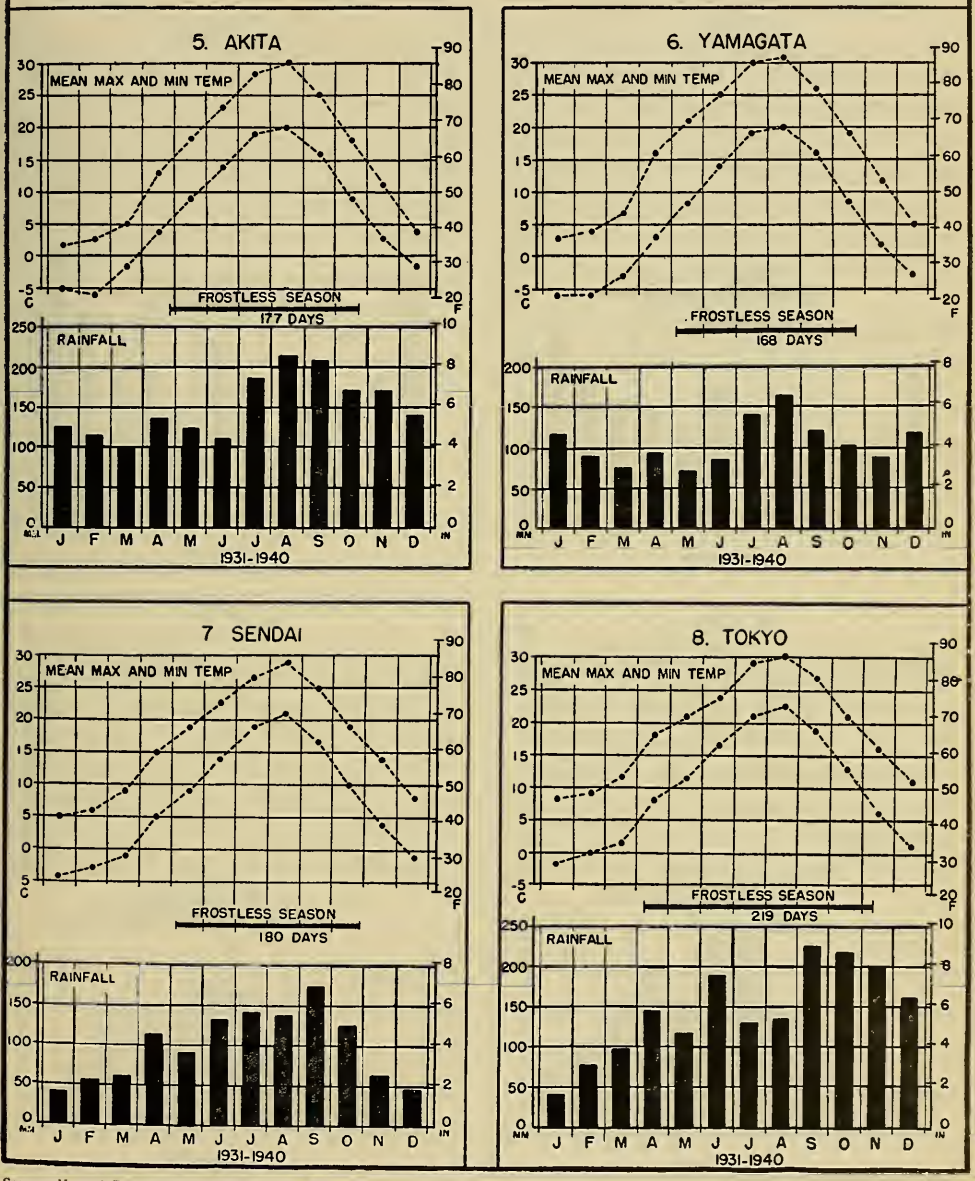
LOCATIONS OF THESE STATIONS SHOWN IN FIGURE 5



Source: Natural Resources Section GHQ SCAP

Figure. 6

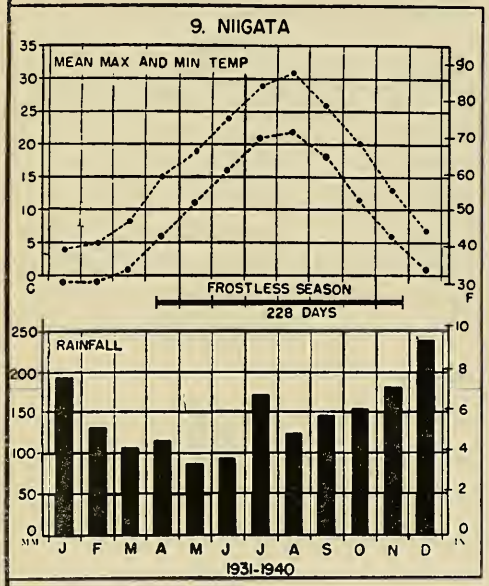
AVERAGE MONTHLY TEMPERATURE, MONTHLY RAINFALL, AND FROSTLESS SEASON BY STATIONS

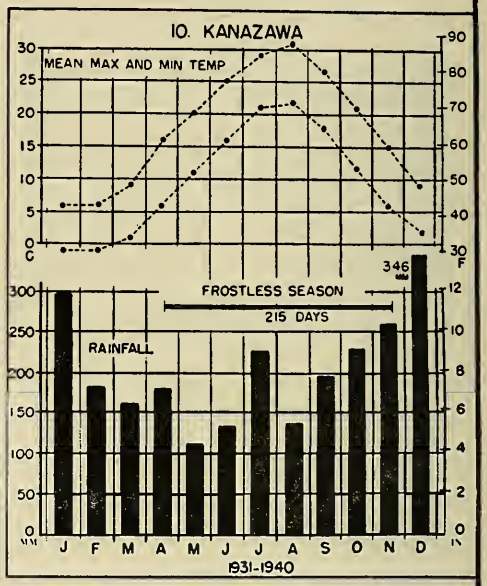


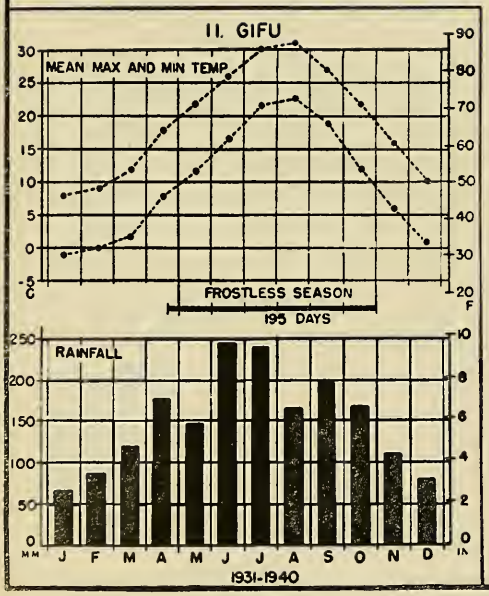
Source: Natural Resources Section GHQ SCAP

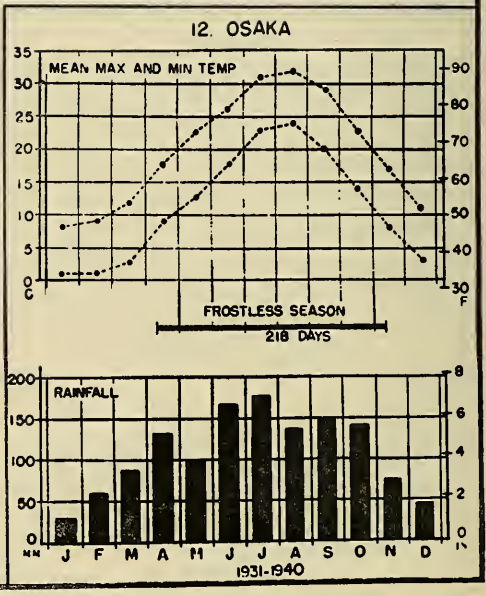
Figure 6 (Cont'd)

AVERAGE MONTHLY TEMPERATURE, MONTHLY RAINFALL, AND FROSTLESS SEASON BY STATIONS





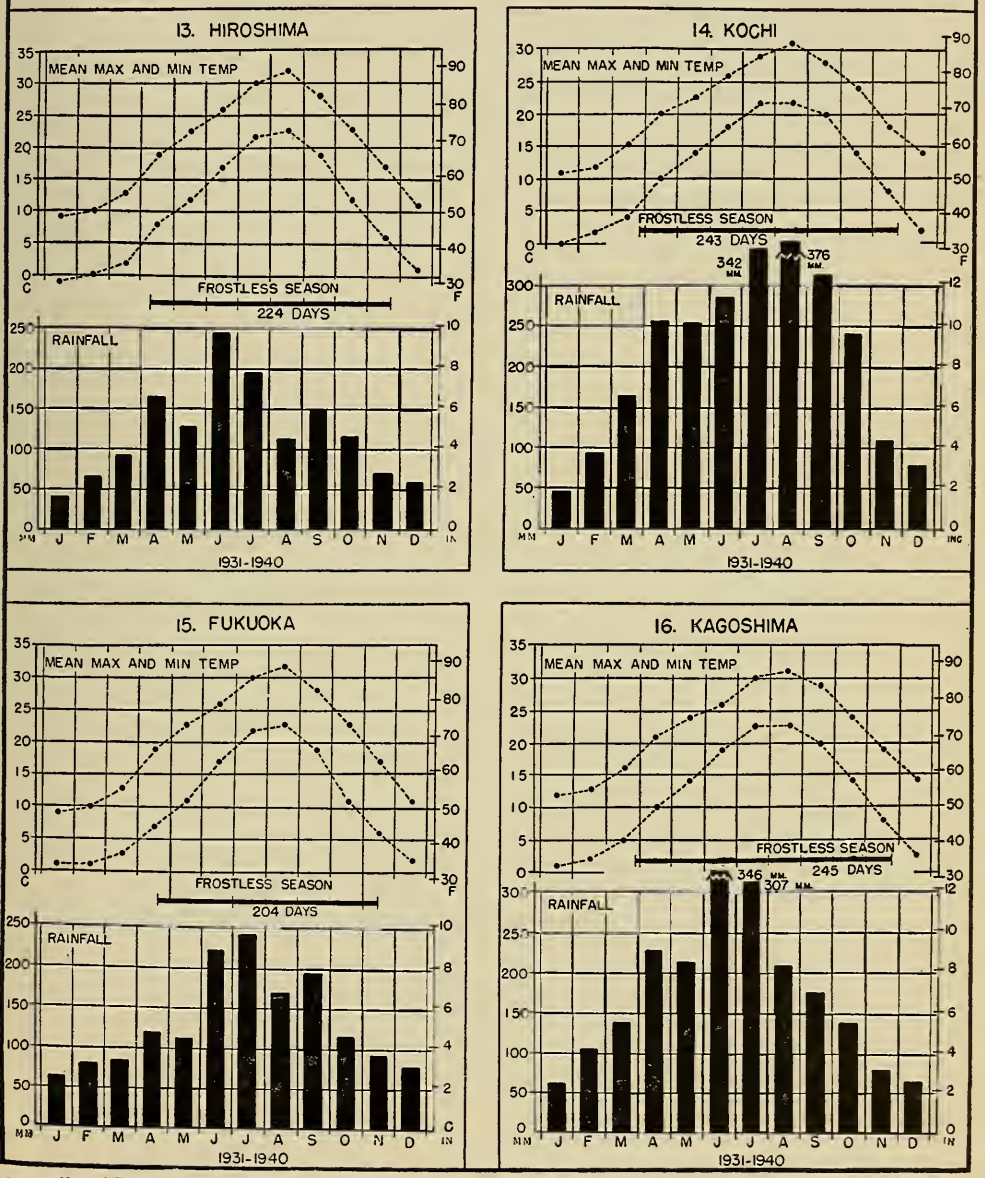




Source: Natural Resources Section GHQ SCAP

Figure 6 (Cont'd)

AVERAGE MONTHLY TEMPERATURE, MONTHLY RAINFALL, AND FROSTLESS SEASON BY STATIONS



Source: Natural Resources Section GHQ SCAP

Figure 6 (Cont'd)

SOILS OF JAPAN

There are few countries in the world in which crop yields per acre are as high as in Japan. Yet the natural fertility of most of the soils of the country is rather low as the climatic and topographic features of Japan are conducive to rather considerable soil erosion and leaching and also to the development of largely acid soils of relatively poor fertility. The attainment of high production levels on the intensively cultivated fields of Japan has been made possible mainly through heavy application of commercial fertilizers and lime, composts, night soil (human excrement), and in many cases also through the laborious transporting of topsoil from other areas.

There are few other countries in the world where the farmers must constantly struggle as they do in Japan to subdue the adverse topography, to minimize the effects of floods, to coax production from the poorly drained and infertile soils. Large stretches of land are physically handicapped or totally unsuitable for profitable farming, and less than one-sixth of the total land area of Japan is under cultivation.

More than 65 per cent of the surface of Japan has slopes in excess of 15 degrees; thus, topography alone is a major deterrent to intensive crop cultivation over large areas of the country where the construction of terraces would be too prohibitive in cost. Moreover, steep slopes are usually in close association with shallow soils, which often are too shallow for profitable cultivation. In the lowlands, there are poorly drained and water-logged soil areas as some of the country is troubled with too much water; there are also stretches of unproductive sand dunes, and sand and gravel.

Soil erosion presents problems on many agricultural and forest lands of Japan and both water and wind erosion are significant in places throughout the country. Sheet erosion is more common, but gully and wind erosion occur quite frequently, too. The land areas susceptible to erosion usually have a poor vegetative cover and are undulating to hilly or mountainous in their topography. Soils derived from volcanic ash—though often nearly level in topography—are light and fluffy and easily windblown; these soils when cultivated are very susceptible to erosion unless windbreaks are planted. Soil erosion presents also a considerable problem on the cultivated sandy beaches and dunes. In many areas, hilly to mountainous slopes which have not been terraced are cultivated up and down the hill, and the land has been eroding there for a long time. The common Japanese practice of annual removal of all forest litter, that is to say, the practice of clean-sweeping the forest floor to obtain compost for cultivated fields, or fuel for the home, or bedding for stock, is conducive to erosion of the steep forest soil areas; similarly, the clearcutting of timber and the removal of all vegetation in conjunction with the often

too-slow reestablishment of a new vegetative cover also are among some major factors contributing to soil erosion in Japan. Except for some sheet and rill erosion in the more strongly undulating areas, soil erosion does not seem to constitute much of a problem on most of the alluvial soils—the most important and most fertile soils of Japan and those which produce most of the food crops.

The major soils of Japan could be classified as residual, as volcanic ash deposits, and as alluvial soils. Climate, vegetation, and parent material—the three primary factors in the formation and development of soils—have influenced to various degrees the nature of the soils of Japan. Where the short and swift torrential streams descend precipitously from the rugged mountain masses that form the greater part of the land area of Japan and deposit their heavy loads of silt, sand, and gravel upon the alluvial plains in the lowlands, the parent material is the dominant factor, as the climatic and vegetative factors have not had sufficient time to permit the development of a mature profile in the alluvial soils. The same is true regarding the extensive land areas of Japan which have been covered with volcanic ash deposits during relatively recent geologic time. And the same is also true regarding residual soils of the steeper mountain slopes disturbed by erosion which continually removes newly formed, weathered material. However, where residual soils have not been disturbed to any considerable degree by continuous soil erosion, climate and vegetation appear to be dominant factors in the development of the profile. Certain representatives of the broad soil groups of the world have been identified recently in Japan. A number of American soil scientists who have conducted the soil survey of Japan have observed that some profile characteristics there are similar to those in the United States at comparable latitudes. It has been suggested, however, that the extremely rugged terrain and steep slopes of Japan, many diastrophic movements with constant changing of topography, the heavy rainfall with continual removal of weathered material to lower levels, and the successive additions of new volcanic ash deposits, all, have helped to hinder the development of mature soil profiles.

In addition to the above-mentioned three primary natural factors that have seemingly often combined to modify and interfere with the "normally anticipated" soil profile development of Japan, man's influence appears to have brought about a marked effect on the development and on the properties and characteristics of some of the agriculturally important soils. In Japan, man through long and intensive usage of soils has greatly altered the characteristics of many cultivated soils. He has built level and bench terraces transforming rough terrain of steeply sloping lands into fields of smooth and level topography. He has transformed thin and rocky soil areas into good, productive fields through bringing topsoil from nearby hillsides. His intermittent irrigation of his fields has changed

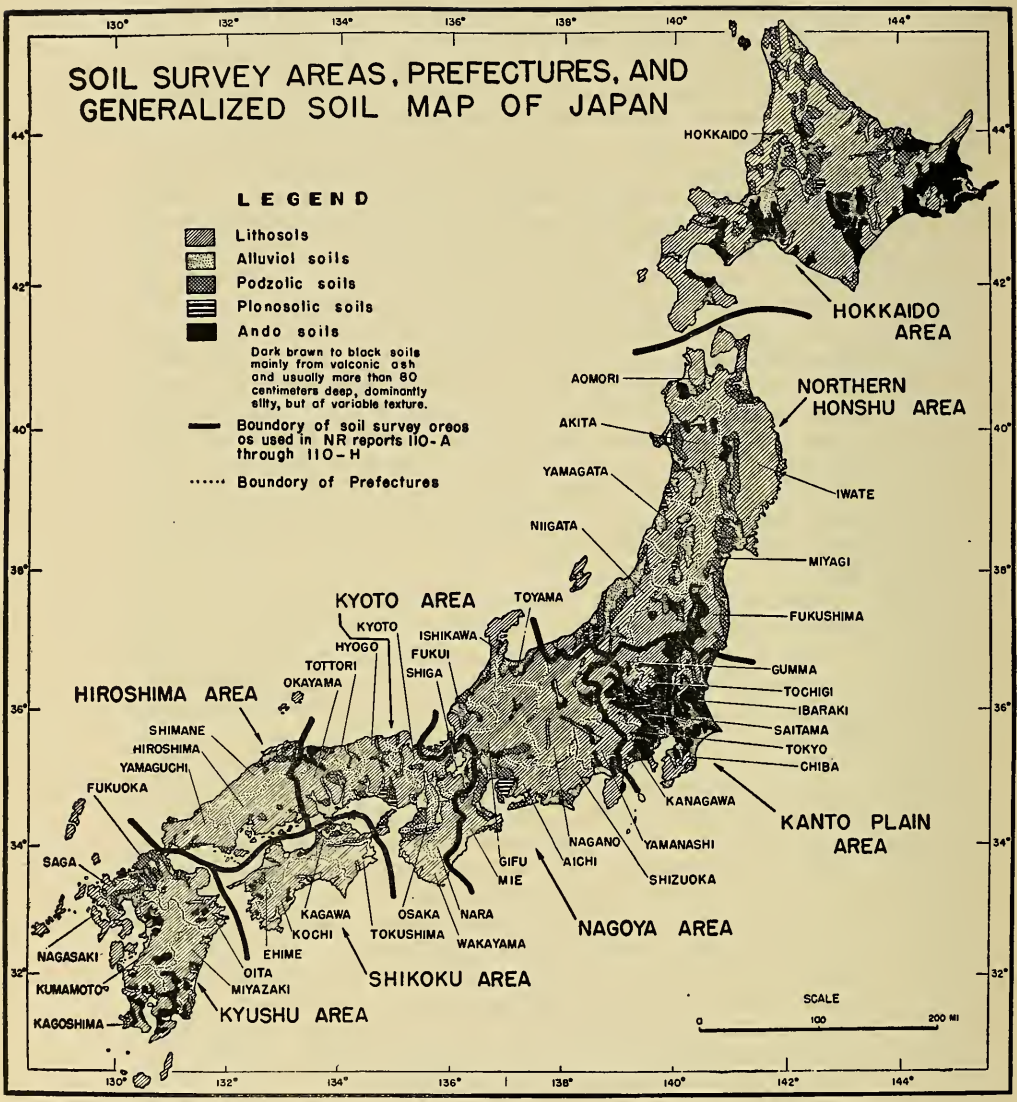
the soil texture and brought about rapid eluviation and illuviation of the soil horizons, giving rise to claypan-like soils.

A detailed description of the soils of the four major islands of Japan will be found in the extensive soil survey reports of the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, in Japan. A generalized soil map, formulated and prepared on the basis of the surveys and showing the distribution of the broad soil groups of Japan, is given in Figure 7 of this paper. As can be seen from this map the reconnaissance soil survey of Japan as published by the Natural Resources Section divides the country into eight soil survey areas. This division is not based on the administrative units of Japan (Figure 1), nor is it based on the geographic or island division of the country. While Hokkaido, Shikoku, and Kyushu are treated as distinct and separate soil survey areas, Honshu has been divided into 5 separate soil survey areas solely for convenience in conducting the reconnaissance soil survey and in mapping the distribution of soils. As may be seen in Figure 7, the soil survey area of northern Honshu corresponds geographically more or less with what is commonly called northern Honshu; the soil survey areas of the Kanto Plain and Nagoya correspond with the region known as central Honshu; the soil survey areas of Kyoto and Hiroshima correspond with the geographic region of southwestern Honshu.

The broad soil groups of Japan (Figure 7) consist of *Lithosols, Podzolic soils, Planosolic soils, Ando soils,* and *Alluvial soils.*

The *Lithosols,* the most extensive soils of Japan, are skeletal or rock soils which have no profile development and which are largely confined to steep, rugged relief. On such relief the natural geologic erosion keeps pace with weathering or surface removal usually, and mature soils do not develop. Hence, the Lithosols are shallow and often very thin, immature soils which consist chiefly of a freshly and imperfectly weathered mass of rock fragments. These soils are highly variable as to composition, and their properties are strongly influenced by the complex geology of the parent rock material over which they are formed. Numerous rock outcrops are common within some of the Lithosol mountain areas. Because of their topography, insufficient depth, susceptibility to drought, content of rock fragments and boulders, and their low natural fertility the Lithosols are poorly suited to crops, are generally of little agricultural importance, and are largely under forest culture. In some regions, small areas of the Lithosols are under chestnuts and fruit culture, with the latter largely at lower elevations. Small areas of the less steep Lithosols are occasionally utilized for the cultivation of field crops.

The *Podzolic soils,* the only zonal soils of Japan, consist of the Gray-Brown Podzolic soils of Hokkaido and northern Honshu and the Red and Yellow Podzolic soils of the southern one-third of the country. These



Source: Based on Data from Natural Resources Section GHQ SCAP

Figure 7

soils, which have developed under a forest cover on high, well-dissected terraces as well as on rolling-to-hilly uplands, are sandy to moderately heavy in their surface texture. The sandy- to coarse-textured Podzolic soils are utilized mainly for nonirrigated (upland) crops. The medium-textured and heavy soils of this group are utilized mainly for the production of nonirrigated crops, but some of these soils, especially in the Red and Yellow Podzolic soil areas of the southern one-third of Japan where the demand for crop land is very great, are bench-terraced and devoted to irrigated rice culture (paddy rice). In the unterraced fields, soil erosion is often severe and many of the nonarable hilly and mountainous Podzolic soil areas of the southern third of the country are often badly gullied wherever vegetative cover is sparse. The Podzolic soils, though low in inherent fertility, appear to respond readily to application of fertilizer and lime.

Planosols (claypan soils), closely associated with Podzolic soils, are intrazonal soils that have well-defined, heavy upper subsoil, which is relatively impervious to water; this subsoil underlies the strongly leached, coarser-textured surface soil. The development of Planosols, which are normally formed under conditions of smooth relief, is believed to have been hastened greatly in Japan by the construction of bench-terraced, irrigated rice fields on undulating, rolling and hilly uplands, which practice has brought about the sharp textural differentiation of soil strata and the cemented or compacted B horizon. The Planosols are the least extensive of the broad soil groups of Japan; they are easily drained, are therefore usually double-cropped, and, though their natural fertility is low, they respond well to heavy applications of fertilizers and manures and produce high yields of rice and other crops.

The *Ando soils* (*an*—dark; *do*—earth), well drained, very dark colored, and derived from wind-deposited volcanic ash, are usually quite acid, light, fluffy, porous, of very low volume weight, and very susceptible to erosion, especially wind erosion. These soils are characterized as a rule by high-organic-matter and high-aluminum-oxide content, and by their strong tendency to fix phosphates into forms which are insoluble in the soil solution. Hence, these soils are especially low in available phosphorus and are comparatively low in inherent fertility. The Ando soils are found in many areas throughout Japan and include soils which the Japanese have previously designated as "Brown Forest soils," "Prairie-Like Brown Forest soils" and "Black soils." The water-holding capacity of volcanic ash soils is reported to be 75 to 200 per cent by weight of dry soil. Upon drying, these soils crack vertically and horizontally and their total shrinkage is estimated to reach up to 15 per cent of the volume of the moist soil. Gully banks and exposure in deep road cuts of volcanic ash soil have shown that several soil profiles have been formed and that each of these has been buried by successive layers of later deposits of volcanic

material. In some areas the deposits of volcanic ash, pumice, and cinders, intercalated with some gravel and sand, have been reported to reach thicknesses of as much as 100 feet. The Ando soils are physically well suited to nonirrigated crops, especially when protected against soil erosion, and they constitute a very important soil group for crop production purposes.

The *Alluvial soils*, formed from water-transported material, comprise the most important agricultural soils of Japan. These soils include those derived from sand, silt, clay, and gravel recently deposited on the present flood plains in stream valleys. As these soils are derived from material washed out of the mountains and hills, their nature and characteristics are to a considerable degree influenced by the geological formation of the uplands, although climate, vegetation, and drainage have left their impressions too. The topographic position of the alluvial soils with respect to stream or sea constitutes, also, an important influence. Thus, the stream bed generally consists of gravel and/or sand; nearest the bed the soil texture is coarse and farther away the soil is of finer texture. Along the seacoast, sand and sandy loam predominate. The alluvial soils are young to very young soils, their profile development is very slight, the variations of depth are associated with depositions, and their relief is largely nearly level. These are the intensively cultivated and the most productive soils of the country, the soils most suitable for permanent agricultural use. The alluvial soils are the soils of the not-extensive lowland areas of Japan scattered throughout the islands and forming the relatively small coastal plains, intermountain basins, and narrow river and stream valleys of the country (Figure 2). The largest of these lowlands, the Kanto Plain, covers only about 5,000 square miles. The other major plains on Honshu are Echigo and Nobi, 700 square miles each, Sendai, 580 square miles, and Settsu, 480 square miles. The largest lowland area of Hokkaido is the Ishikari Plain which covers over 800 square miles, and the largest lowland area on Kyushu is the Tsukushi Plain of 460 square miles.

The remaining alluvial lowland areas of Japan consist largely of hundreds of river and stream valleys extending up into the mountains and ranging from a few square miles to a few hundred square miles each.

Most areas of the poorly drained and medium to moderately heavy alluvial soils of the lowlands are devoted principally to irrigated rice culture. These paddies are utilized also for double-cropping wherever climatic and soil-drainage conditions permit winter crop production. After the rice crop is harvested, the paddy is plowed or spaded and bedded or ridged to provide drainage, and, in the fall, wheat or barley and sometimes winter vegetables are seeded or transplanted onto the ridges for the production of a nonirrigated winter crop. The drainage problem constitutes, often, a serious handicap to the agriculture of Japan. Many of the

naturally poorly drained lower river valleys or the sites of former lagoons are suitable for rice production during warm months, but are waterlogged and unsuitable for winter grain or vegetable crops. Thus, drainage difficulties of about 20 per cent, or 1,540,000 acres, of the approximately 7,688,000 acres of irrigated rice in Japan make impossible any winter crop production on these acres despite the fact that climatic conditions to which these areas are subject are generally favorable for winter crops.

Muck and peat soils are almost always in close association with alluvial soils. The half-bog soils and muck are sometimes cultivated and used for rice production, and in some peat areas rice paddies are being developed after a few feet of peat are removed as a source of fuel.

The well-drained sandy soils of the lowlands are utilized for irrigated rice culture wherever there is an adequate supply of irrigation water and a high water table. When no irrigation water is available these sandy soils are utilized for the production of nonirrigated cereals, vegetable crops, fruits, mulberry trees and tea plants. Maintenance of dikes along the major streams to protect the flooding of lowlands makes possible production of vegetables, fruits, and mulberries on the sands and gravels adjacent to stream channels. Good yields of vegetables, mulberries and some fruit crops are also produced in the sand dune areas of Japan through a hydroponic-like system of farming where fish scrap meal seems to make a particularly suitable fertilizer and in which the cropland areas are protected from erosion by systems of pine shelterbelts.

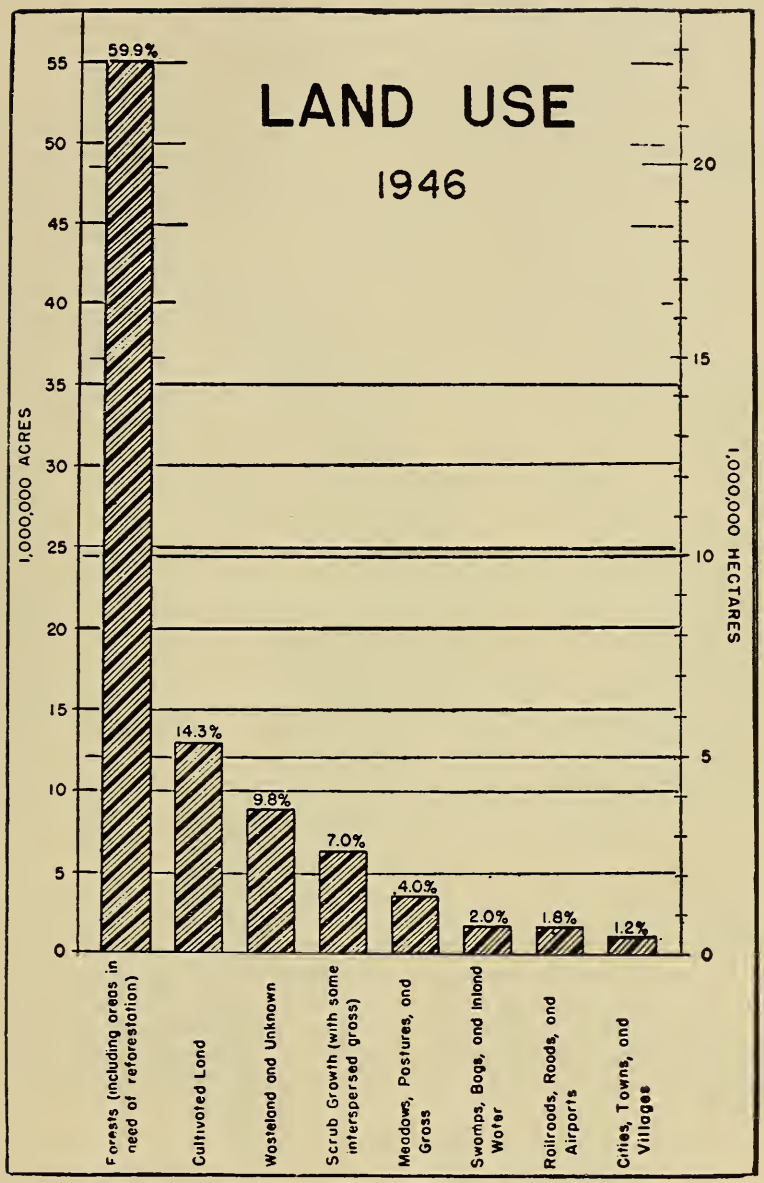
NATURAL VEGETATION OF JAPAN

The verdant hillsides and mountains of Japan with their luxuriant and diversified vegetation reflect the effects of abundant rainfall, of varied relief features, and of the great latitudinal extent of the country. The natural vegetation of Japan consists largely of broad forest stretches, extensive areas of grass-forest-brush mixtures, and of grasslands which are scattered and relatively limited in area. The forests, which occupy most of the rough and rugged mountains and nearly all the unarable land of Japan, cover approximately six-tenths of the total land area of the country (Figure 8). The scrub growth with some interspersed grass, the meadows, the pastures, and other grasslands cover another one-tenth of the total land area. Such a large proportion of woody plants in relation to the whole flora as well as the great variety of the forest species of Japan is rather striking, and Japanese forests are believed to contain more tree species than any other corresponding areas within similar latitudinal setting. These species range from the hardy dwarf stone pine, birch, Sakhalin fir, and Yedo Yezo spruce in high latitudes and altitudes of Hokkaido, to the semitropical mangrove, Japanese fern palm, and fountain palm in the lower latitudes and altitudes of southern Kyushu.

The wide range of latitude, the differences in exposure and position, and the highly broken terrain, resulting in frequent and often very abrupt altitudinal changes throughout the country, form numerous highly varied climatic habitats within a great many areas and regions and permit no simple division of the land area of Japan into broad and uniform natural climatic-vegetation belts.

Forests

A division of the forests of Japan into three climatic forest-type zones is shown in Figure 9. This division as formulated by the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, consists of the warm or evergreen broadleaved zone, the temperate or deciduous broadleaved zone, and the cold or coniferous zone. As will be seen from Figure 9, in regard to altitude each climatic-forest-type zone descends in general northward and ascends southward. Thus, the zone of evergreen hardwoods occurs in Kyushu below 2,800 feet elevation, in Shikoku below 2,300 feet, and in Honshu (south of 36° N.) below 1,600 feet. The zone of the deciduous hardwoods occurs in Kyushu above 2,800 feet elevation, in Shikoku from 2,300 to 6,000 feet, in central Honshu from 1,600 to 4,600 feet, in northern Honshu from sea level to about 3,600 feet, and in Hokkaido (south of 43°30′ N.) below 1,500 feet elevation. The coniferous zone occurs in Shikoku above 5,400 feet, in central Honshu above 4,200 or 4,600 feet, in northern Honshu above 3,000



Source: Natural Resources Section GHQ SCAP

Figure 8

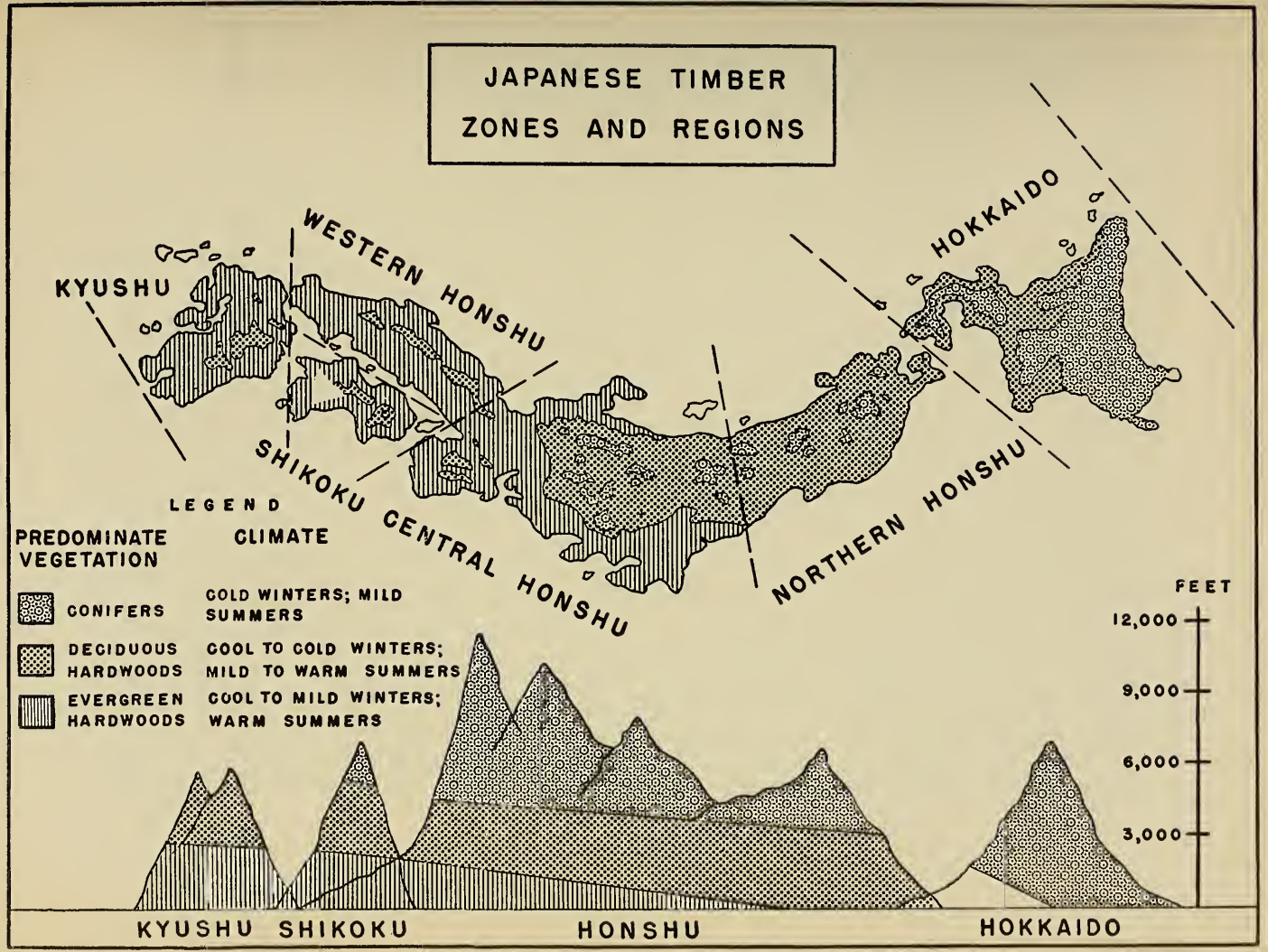
or 3,600 feet, in southern Hokkaido above 1,000 feet, and in the rest of Hokkaido (north of 43°30′ N.) over most of the land area.

The aforementioned division into three distinct forest-type zones is a highly generalized division based largely on the predominant vegetation within each zone; and within each zone one may find various groupings and combinations of species from all or at least two of the three forest-type zones. Thus, the characteristic species of the evergreen broadleaved zone include (1) evergreen broadleaves such as several live oaks,[1] laurel and camphor, (2) deciduous broadleaves such as the Japanese chestnut, zelkova, elm, and ash, all of which occur in the colder areas of this zone, and (3) conifers such as several pines, momi fir, southern Japanese hemlock and *sugi* or Japanese redwood. Similarly, the characteristic species of the deciduous broadleaved zone include (1) broadleaves such as beech, oaks, maple, ash, chestnut, magnolia, walnut, alder, elm, cherry, and birch, and (2) conifers such as *sugi, hinoki* or Japanese cypress, pines, Japanese larch, fir, spruce, and hemlock. And, the characteristic species of the coniferous zone include (1) conifers such as fir, spruce and Japanese yew, and (2) deciduous broadleaves such as birch, alder, aspen, and willow. Generally speaking, the principal forest plants of Japan include *sugi, hinoki* and *sawara* (cypress), fir, hemlock, larch, spruce, pines (red, black, white), false arborvitae, oak, beech, maple, ash, chestnut, magnolia, cherry, birch, elm, aspen, linden or basswood, camphor, paulownia, and numerous bamboo species. Bamboo forests are widespread throughout the greater part of Japan, with tall bamboo trees usually found in the lowlands and dwarf formations widely distributed in the mountains, often forming dense undergrowth in forests.

The names of some of the more common forest plant species of Hokkaido, northern Honshu, central Honshu, southwestern Honshu, Shikoku, and Kyushu are given in Table V.

Hokkaido, which is relatively thinly populated and which provides one-fifth of Japan's forest area and one-third of the timber volume of the country, and the rugged mountain regions of Honshu, Shikoku, and Kyushu are largely densely wooded and covered by natural forests. Comparatively few forests have been left throughout the greater part of the lowlands, mountain valleys, foothills or low mountains of the three latter islands, as nearly every foot of these very thickly populated areas has been under cultivation for a great many centuries. The opportunity for presenting an accurate picture of the original forest cover of a considerable part of the country is no longer available because in addition to the ancient farm lands of Japan, which have long since been cleared of all the original vegetation, there are also the very extensive man-planted forests.

[1] Scientific names of forest species given in Table V.



Source: Natural Resources Section GHQ SCAP

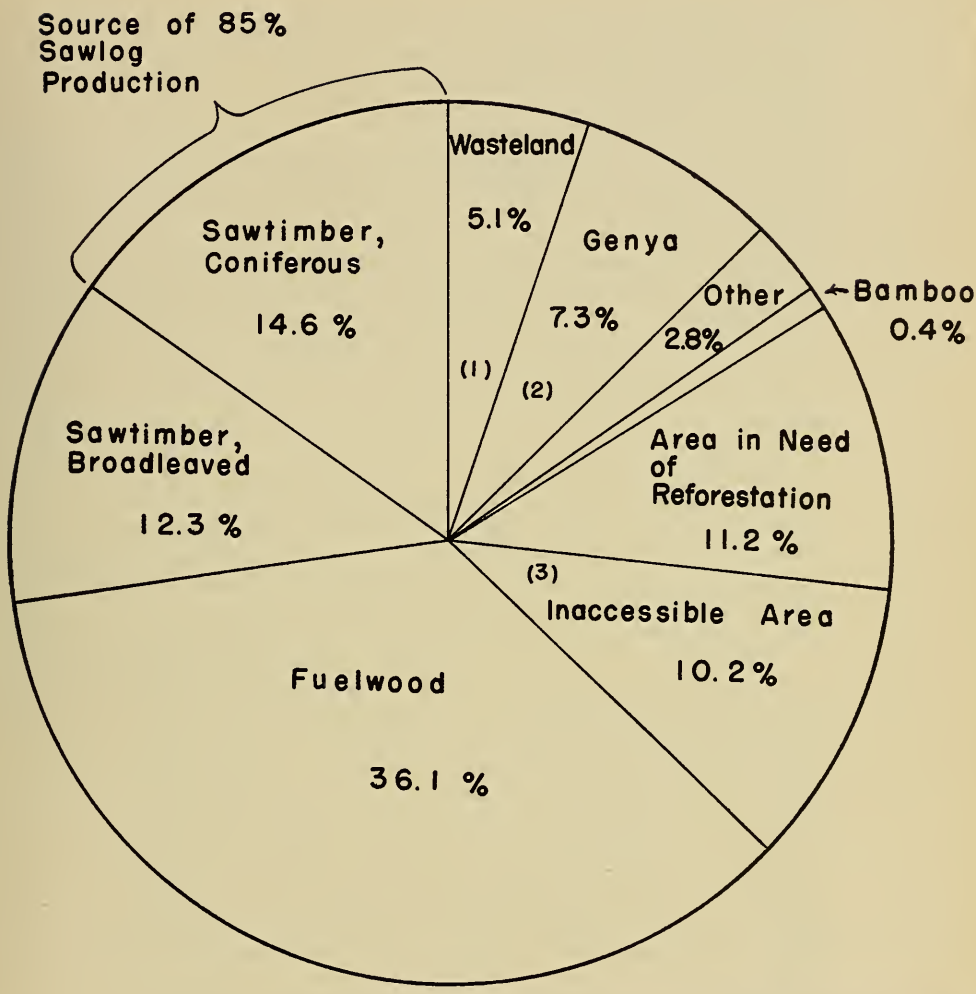
Figure 9

Forest tree planting in Japan, especially of conifers, has been a tradition of the Japanese for over a thousand years, it is said. Some of the very old groves surrounding the numerous temples and shrines of the country were planted by man many centuries ago although today often conveying the impression of being natural forests, as neither trees nor undergrowth are ever disturbed there. It is estimated that about one-third of the total forest area consists of planted forests, and that each year over 550,000 acres of forest land are being planted in Japan.

Throughout most of Japan the commonly practiced forest harvesting methods of clearcutting and overcutting are among the major factors contributing to the need for the large scale annual reforestation program. Reforestation, thus, constitutes a very important step in maintaining a supply of timber, as the ordinary methods of growing forests, especially coniferous forests, in Japan are planting and clearcutting. Cossitt estimates that as of the summer of 1951 a huge backlog of about 7,350,000 acres of denuded land was in need of reforestation in Japan, primarily as a result of greater cutting and reduced forest-nursery production during World War II. This backlog, augmented by the areas clearcut annually, has created a tremendous demand for planting stock.

Conifers are the most commonly planted forest trees. A number of strains or ecotypes of some of the major forest species of the country are recognized. The surveys of Cossitt and of Gilbert and Haibach suggest that the principal conifers planted in Hokkaido are white fir or *todomatsu*, Yedo Yezo spruce or *ezomatsu*, and European spruce, while the principal conifers planted in Honshu, Shikoku, and Kyushu are the Japanese redwood or *sugi*, Japanese cypress or *hinoki*, red pine or *akamatsu*, black pine or *kuromatsu*, and larch or *karamatsu*. The principal broadleaved species planted in Hokkaido are swamp ash or *yachidamo* and Japanese chestnut or *kuri;* while the principal broadleaves planted in the rest of the country include the red oak or *kunugi*, camphor or *kusunoki* and chestnut. In Honshu, Shikoku and Kyushu the common practice is to plant the Japanese redwood or *sugi* on the best site, that is, in the valley or on the lower slope, the Japanese cypress or *hinoki* on the middle or upper slope, and the red pine or *akamatsu* on the ridge or higher slope. As the two most extensively used conifers, *sugi* and *hinoki*, do not reproduce well naturally their forests are managed by clearcutting or group selection followed by planting, while the pine forest is usually selectively cut and can be depended upon to reproduce naturally. From 1,200 to 1,800 conifers per acre is the usual rate of planting. Most of the broadleaves normally are planted at the rate of 800 to 1,000 trees per acre, though the chestnut is commonly given more space and planted at the rate of 600 trees per acre to permit the development of a branching, nut-producing tree. The replanting of the areas in need of artificial reforestation usually takes place from one to three years after the cutting of the

FOREST LAND USE OF JAPAN



(1) ROCKY, BARREN LAND NOT SUITABLE FOR PRODUCTION OF TIMBER.

(2) WILD LAND, PRIMARILY IN GRASS, EITHER TREELESS OR CONTAINING SCRUB OR SCATTERED TREE GROWTH.

(3) REMOTE FOREST AREAS LACKING NECESSARY TRANSPORTATION FACILITIES TO PERMIT ECONOMIC TIMBER HARVEST.

Source: Natural Resources Section GHQ SCAP

Figure 9A

forest, though in some of the privately owned forests cutting of the forest stand is followed by production of food crops for several years prior to the replanting of forest trees. *Sugi* is the most outstanding conifer and most widely planted timber tree and constitutes nearly one-half the total of planted trees throughout the area extending from southern Kyushu to northern Honshu. The country owes much of the beauty of its magnificent and luxurious groves and gardens to this very beautiful, tall (often over 100 feet in height), and stately tree which resembles so much the sequoias of California.

Of the coniferous, broadleaved, and mixed coniferous and broadleaved forests in the estimated total of 61,650,000 acres of forest land in Japan, the broadleaves occupy over 27,000,000 acres, the conifers occupy over 15,500,000 acres, and the mixed forests nearly 12,000,000 acres. Bamboo represents an additional minor forest type of the country and it occupies about 250,000 acres. *Genya*,[2] which constitutes a potential forest-land area, and other nonproductive areas within forests occupy nearly 6,500,000 acres of land.

Though the broadleaved forest area exceeds considerably the area occupied by conifers, the latter constitute the greatest source of sawlog production of the country (Figure 9A), whereas broadleaved trees (nearly 60 per cent of which are unfit for production of sawlogs) are the main source of timber cut for firewood and charcoal. The sawtimber is utilized primarily for construction of dwellings (99 per cent of the houses in Japan are made of wood) and for the pulpwood industry.

The dependence of Japan upon her forests is more pressing perhaps than that of any other nation in the world. Japan has only one-tenth as much forest land as the United States, but she has more than one-half the population of the United States. The comparison is not complete unless one realizes that Japan is far more dependent upon a forest economy than is the United States, as wood means much more in the everyday life of Japan. The Japanese people depend upon wood for their shelter and industrial construction, for their heating, cooking, wood pulp and wood fibre, railroad ties, mine props, and for maintenance of their fishing fleet. The people of Japan walk on wooden slippers and wear rayon made from wood pulp, and the forests supply a great many other everyday needs of the people including a number of edible products such as mushrooms (the most noteworthy of which is the *shiitake (Cortinellus berkeleyanus)*, various nuts, roots, berries, and bamboo shoots. Bamboo has a great many uses in Japan; it is, for example, used in the framework of houses, for screens, for sails of junks, for water pipes, for making mats and paper, and for making many other articles.

Japan has always depended heavily on her forests as a source of fuel. More than 60 per cent of Japan's forest harvest is utilized for firewood

[2] Wildland which is treeless or which has only scrub or scattered growth.

and charcoal, whereas in the United States the forest drain for these purposes is less than 20 per cent, and about one-half of this comes from forest and sawmill waste. Firewood in Japan is used for cooking and for heating bath water. In winter, houses are warmed with charcoal. In recent years, many automobiles have been operated in Japan on gas generated from wood or charcoal. Bruce states that even the industries of Japan supplement their coal supply with wood fuel. Some of the country's fuelwood comes from farm wood lots and trees planted to stabilize soil and shade highways, he continues, some comes from sawmills in the form of slabs, edgings, ends, and sawdust, more fuelwood comes from the tops and branches of trees logged for timber, but chiefly fuelwood comes from the coppice or brush forests, those broadleaved forests that have been badly exploited, robbed of their timber trees and reduced through clearcutting to stumps from which sprouts are taken periodically for firewood and charcoal. About two-thirds of the accessible broadleaved forests of Japan have been reduced to coppice, which now amounts to over one-fourth of the total forest land of the country. The average height of these low-growth forests ranges between 10 and 15 feet. They are cut over at relatively frequent intervals, that is every 8 to 20 years, and their regeneration depends on their ability to reproduce by sprout growth from the stump. The cutting of firewood and the making of charcoal (two-thirds of all wood cut in Japan is for firewood and charcoal) together with the production of sawtimber are highly important sources of income to the farmer during the slack winter season when there is not too much to do in the fields.

Because of the extremely mountainous terrain which requires forest cover and watershed protection, Japan depends on her forests also to regulate stream flow, to maintain water tables, to minimize soil erosion and silting of reservoirs and farm lands, and to prevent or mitigate destructive floods. The forests of Japan have thus an important influence on food production, and forestry plays a highly valuable role from the agricultural-land-use point of view. The importance of forests to the economy of the country has long been recognized by the people of Japan. Forest conservation, a system of rigid forest protection, and restrictions on cutting and burning forests date back in Japan over many centuries, and the Japanese were one of the peoples earliest to engage in large scale reforestation work. There are many research institutions in the country endeavoring to ascertain and promote better forest practices and forest management systems and a better utilization of forest products. The Ministry of Agriculture and Forestry is responsible for the management of the national forests and of private lands forested by the government and under the law the Ministry provides also guidance and supervision over private forests. During the last decade, however, the need for forest products has increased greatly, with consequent increase of

forest cutting, and with reforestation unable to keep abreast of the progressive overcutting. In the course of war, as shortages in material and manpower steadily increased the proportion of clearcutting as compared to selective cutting of forests greatly increased. Privately owned accessible forest areas appear to have suffered the most from severe overcutting and insufficient replanting during the war period. The heavy demands of the postwar period for reconstruction and rehabilitation also have been a heavy drain on the forest resources of the country.

The Natural Resources Section, after extensive surveys, issued various comprehensive reports on the effect of forest cover on the erosion and flood situation in Japan and on the country's forest area, volume, and growth. These reports are based on four years of work of a number of forest and hydrology specialists and are designed to form a dependable basis for policy and practice. They suggest that Japan's timber is being cut much faster than it is being replaced through growth, that is, that Japan's forest harvest is far in excess of forest growth, and that although Japan's ratio between forest area and cultivated land is the highest of any country outside the tropics, with the exception of Finland, she is faced with a serious forest situation that may have extremely grave implications for the national well-being.

Thus, Cummings, Haibach and Wise state that the area now occupied by productive forests is inadequate to supply the nation's timber needs on a sustained yield basis; that only 15 per cent of the total forest area of the country is occupied by coniferous timber, which provides 85 per cent of the total volume of sawlogs cut annually (Figure 9A) ; and that 12 per cent of the forest land area is occupied by broadleaved timber, which provides the additional 15 per cent of the annual harvest of sawlogs. The remaining 73 per cent of the total forest land area of Japan consists of fuelwood forests (coppice), areas in need of reforestation, inaccessible forest areas, *genya*, wastelands, and other miscellaneous nonproductive types (Figure 9A). The seriousness of the situation is illustrated by the fact that the usable coniferous sawtimber in accessible areas comprises a total potential volume which is only 9 per cent more than the coniferous volume cut in Japan during the past 15 years.

About one-half of the forest land of Japan is in private ownership and most of the rest in national and community ownership, with relatively small forest areas under the ownership of the various temples and shrines of the country. Kircher and Dexter state that the privately owned forest area of the country is in the hands of more than 5,000,000 individual owners whose per capita forest holding consists of about 5 acres of forest land, that nearly eight-tenths of the coniferous forests of the country are in private hands, and that heavy overcutting has left almost no old timber in these private coniferous forests. It is pointed out also that heavy exploitation and destructive cutting practices have very seriously

damaged the private forests of Japan, that, as a result, private coniferous forests contain only slightly over one-fourth the stand of the national forests per acre of land and because of the reduced growing stock the annual growth per acre of the private forests is less than one-fourth that of the national forests. As Japan must depend to a great extent upon its coniferous forests to furnish the bulk of the badly needed construction material and domestic wood pulp, because conifers are better suited for these purposes than hardwoods, the coniferous forests constitute the most important forest resources of the country. Yet, during 1950 alone the cut in the accessible coniferous stands was estimated at 305 per cent their annual growth. The American forest experts point out that, if continued, the heavy overcutting of private forests threatens depletion of sawlog-size trees in Japan within 15 years.

Foresters of Japan face a very real problem in managing privately owned forest resources in such a way as to meet some of the pressing, immediate needs of the national economy of the country and at the same time refrain from injuring the productive powers of soil and forest, and the protective values of the latter. The ordinary method of planting and growing coniferous forests and clearcutting of the entire stand 35 to 60 years after planting have greatly reduced the timber yield and quality as well as the watershed-protection value. The latter is an especially serious matter, particularly relative to the prevailing practice of clearcutting rather steep and even exceedingly steep slopes, some up to 60 degrees, which frequently leads to severe soil erosion, accelerated runoff, deterioration of forest areas, excessive siltation of water reservoirs, and flood damage to agricultural land.

Schenck has observed that Japan's rugged topography, heavy precipitation, long shoreline, and strong winds are conducive to serious soil erosion and sand dune movement, and that denuding of mountain slopes has intensified soil erosion and silting of river channels, in consequence of which normal runoff of excess waters has been retarded and threat of floods in some of the country's most productive farmlands has been greatly increased.

Kraebel, in his extensive survey of some of the major problems of flood control in Japan, stresses that although floods have been intensified in recent years by severe typhoons, the real causes are to be found in an excessive amount of clearcutting, in the frequent gathering of forest litter in the mountain areas, in the poor and weak growth of hardwood coppice, in the numerous gullies formed as a result of the prevailing practice of skidding logs down steep slopes, and in the cultivation and consequent erosion of steep slopes that need the protection of forest cover. Rugged topography, heavy precipitation, and the tremendous population pressure on the land appear to provide the basic factors for high annual toll of flood and erosion damage in Japan.

The population pressure on the land and the immediate economic needs of the people often result in forest administration measures which, though conducive to temporary benefits, are at the expense of the permanence and future use of forest, soil, and water resources of the country.

In the recent flood history of Japan, states Kraebel, the cause-and-effect relation between depleted watershed cover and increased runoff and erosion stands out clearly and is recorded in voluminous reports of the Forestry Agency, Ministry of Agriculture and Forestry, and other government agencies of Japan. The flood and erosion damage to Japan has developed to a stage where it constitutes a national emergency. Losses of food crops, damage to paddy lands, erosion of soils, and destruction of life and property are seriously retarding the economic rehabilitation of Japan. The seriousness of this problem, observes Kraebel, can be perceived clearly in the fact that in Japan, which is smaller than the State of California, the annual flood losses now exceed those of the entire United States and are steadily increasing.

The need for positive action to meet Japan's forestry problems and the danger of complacency toward depletion of forest resources, toward soil erosion, toward premature siltation of dam reservoirs which affect storage of water, and toward increased flood damage are well recognized. Forest management to secure quality and maximum yields, to secure control of erosion and floods, and to provide the most efficient methods of reforestation and protection from fire, insects, and disease is one of the major objectives of forest research program formulated for Japan by the Natural Resources Section.

Grasslands

The combined area of the various grasslands of Japan is estimated as over 7,200,000 acres of land or about 8 per cent of the total land area of the country. These grasslands consist of (1) the *genya* lands, which are defined (Figure 9A) as wild land areas, primarily in grass, either treeless or containing scrub or scattered tree growth, (2) areas of forage-producing lands intermingled with forests, and (3) areas converted to grassland through removal of the forest. All these regions produce native forage which is utilized for grazing and for cutting for hay or compost and, in southern Japan, for thatching material. Open grazing is practiced most widely in northern Honshu and Hokkaido, the grazing season there being usually from May to October. Cutting of grass is done by hand with a short knife or sickle and cut grass is then transported to farm house or field, all of which involves strenuous labor and expenditure of much time, as most of the grasslands are located at a considerable distance from the farm and a great deal of the transporting of cut fodder is done with no mechanical or animal power but by the farmer himself; he either carries pack loads or hauls with a cart. Japan has given relatively little attention

to the production of livestock and livestock feed, as neither milk nor beef are items of daily diet there.

The Japanese farmer's lack of knowledge of and interest in animal products and livestock no doubt reflects the pressure for maximum food from the relatively limited agricultural land resources of the country, as usually more people can be fed from a given area of arable land devoted to directly consumed high-calorie-producing food crops than from the same amount of land devoted to forage which will be converted into edible animal products. Though the availability of animal proteins from the well-exploited marine fishery and adherence to Buddhist principles which discourage killing animals have probably historically influenced the status of animal husbandry in Japan, the small amount of livestock appears to be primarily due to feeding problems. There is actually no competition between pasture land and cropland, as most of the native pasture land of Japan is untillable. There is, however, the problem of production of concentrated feeds for winter use, which is to a large extent competitive with food production.

Most of the large farm animals in Japan are kept for draft purposes, and the number of small animals per capita is very low. In Hokkaido, horses, mainly, are used as draft animals, while in the rest of Japan cattle are more common as draft animals than are horses. When the livestock is not used for draft purposes the most common practice is to keep the animals in the stable or farmyard and feed concentrates and roughage from field borders and dikes, forests and grasslands, cut and carried to the livestock. Only a relatively small fraction of the stock is grazed on pasture land. Except in Hokkaido, pasture land is usually in small scattered areas adjacent to cultivated land, and in fairly large tracts at higher elevations. In northeast Hokkaido, there are sizable areas of open, fairly level land utilized as pastures, for the abundant summer-fog of that region does not permit intensive crop production. The high-altitude pasture areas throughout the greater part of the country are usually unsuitable for intensive crop production because of topography, soils, climate, or any combination of these factors.

In addition to the production of forage for use by livestock or for use as compost in fields, or thatching material for dwellings and farm buildings, native grasslands serve also the highly important function of providing for upper slopes of watersheds the needed protection from destructive erosion.

Most of the wild pastures support a mixture of coarse native grasses and shrubs and their carrying capacity is very low. The principal components are the dwarf bamboo or *sasa* and the Chinese silvergrass or *susuki*.[3] The latter grows well in dry soils and, once established, propa-

[3] Scientific names of meadow species given in Table VI.

gates readily. The young leaves are palatable to livestock, whereas the mature leaves are too coarse and sharply toothed, and are unfit for forage, but provide the principal material used for thatched roofs. Natural pastures appear to have ample moisture and seldom are subject to drought injury. Winter-hardy plant species are essential for high altitude pastures and for northern pastures in Japan.

In reviewing the management of grasslands of Japan, Dutton has observed that the prevailing practice is to cut grass from six weeks to two months after full maturity, at which time the resulting product has lost most of its feeding value. At this time the cut grass has a high lignin and low protein content and is neither palatable nor nourishing for livestock. The heavy spring work in the fields and paddies (irrigated rice fields) appears to make it difficult for the farmers to spare time for harvesting grass at the proper season. An attempt at curing or drying grass during the heavy rains and high humidity of the spring period seems to present an even more complicated and difficult problem. Dutton notes that Japan is losing incalculable livestock feed values every year through failure to make the best use of forage-producing lands; that conversion of spring-cut grass to ensilage would go a long way toward providing the kind of feed needed for winter maintenance of work, beef, and dairy animals; that generally the native grasslands are largely in reasonably good condition though the quality of their forage resources is poor; that the native grasslands cannot be counted upon to furnish the kind of forage required for production of good beef and dairy animals; that conversion of native grasslands to improved pastures through planting of introduced suitable plant species would greatly increase the forage value of these lands; that the prevailing practice of burning the pastures annually may be of doubtful value and it certainly increases the danger of destruction of the adjacent forest stands and creates soil erosion hazards especially on the steep upper slopes of watersheds where a permanent good grass cover is highly essential.

According to Dutton, the principal native forage species, with order of importance varying by localities, include the following:

Susuki and *kariyasu,* two silvergrasses distributed widely over non-forested areas, commonly used for fodder, compost, and thatching; palatability for grazing low, except in early stages of growth.

Shiba, Japanese lawn grass, common in open areas, particularly in Honshu and Kyushu; palatability comparatively high throughout the season, easily overgrazed, with resulting surface erosion.

Chi-gaya, cogon grass or satintail, distributed over all of Japan but most common in southern Honshu and Kyushu; used for grazing but harsh and unpalatable; a grass requiring a great deal of sunlight and found in open areas and on dikes and river beds.

Toda-shiba, found throughout Japan in both open and wooded areas

but most common in northern Honshu and Kyushu; loses palatability after early stages of growth.

O-garukaya, commonly found in open areas in Honshu and Kyushu; used for grazing; comparatively palatable.

Sasa, the dwarf bamboo grass of several genera and species, used as forage throughout Japan; commonly found in open areas, although *Sasa nipponica* will thrive in woodland under 30 to 50 per cent shade; propagation mostly by root with only one crop of seed from each generation; one outstanding characteristic: retention of protein and palatability well into the season; used both for grazing and hay and, although leaves and stems are somewhat harsh, possesses a fair degree of palatability; is dominant in Hokkaido; ranges in Hokkaido frequently used for winter grazing, particularly by horses.

Hagi, Japanese bush clover, the principal leguminous plant on open native ranges; used for both grazing and hay and quite palatable, before maturity, for all kinds of livestock.

A list of some of the more common species found in grasslands and meadows of the various geographical regions of Japan is given in Table VI.

TABLE V

CHARACTERISTIC FOREST SPECIES OF JAPAN

ZONE	CLASS	COMMON AND SCIENTIFIC NAMES *	REMARKS
		REGION: HOKKAIDO (Latitude 41°-46° N.; Longitude 140°-146° E.)	
		BELOW 1,000 FEET IN ELEVATION	
Mixed Coniferous and Deciduous Zone	Conifers	"Asurobe" (False arborvitae) (*Thujopsis dolobrata* S. et Z. var. *hondai* Mak.)	Found chiefly on Oshima Peninsula.
		Japanese redwood ("Sugi") (*Cryptomeria japonica* D. Don)	
		Yedo Yezo spruce (Hondo spruce) (*Picea yezoensis* Carr.)	Occurs chiefly on Rishiri-jima at this elevation.
	Deciduous Broad-leaved Species	Japanese beech (*Fagus crenata* Bl.)	Does not occur naturally north of Oshima Peninsula and Okushiri-jima.
		Alder (*Alnus japonica* S. et Z. var. *arguta*)	Grow on moist areas of coastal plains, under 200 feet elevation.
		Alder (*Alnus hirsuta* Turcz.)	
		Swamp ash (*Fraxinus mandshurica* Rupr. var. *japonica* Max.)	
		Painted maple (*Acer mono* Max. var. *velutinum* Boiss.)	
		Maple (*Acer aizuense*)	
		Japanese elm (*Ulmus davidiana* Planch. var. *japonica* Nakai)	
		White oak (Daimyo oak) (*Quercus dentata* Thunb.)	Prefer rather dry areas of coastal plains, under 200 feet elevation.
		Japanese white birch (*Betula platyphylla* Skat. var. *japonica* Hara)	
		Ash (*Fraxinus excelsissima*)	
		Willow (*Salix sachalinensis*; S. *pet-susu*; S. *lackschewitziana*; S. *jessoensis*; S. *miyabeana*; S. *triandra* Linn. var. *nipponica*; S. *gracilistyla*)	Found along larger streams.
		Willow (*Toisusu urbaniana* Kimura)	
		Japanese poplar (*Populus maximowiczii* Henry)	
		Siebold's beech (*Fagus crenata* Bl.)	Characteristic species found on hillsides.
		Japanese white oak (Water oak) (*Quercus crispula* Bl.)	
		Japanese walnut (Giant walnut) (*Juglans sieboldiana* Max.)	
		Japanese hop-hornbeam (*Ostrya japonica* Sarg.)	
		Japanese elm (*Ulmus japonica* Sarg.)	
		Japanese wych elm (*Ulmus laciniata* Mayr.)	
		Japanese magnolia (*Magnolia kobus* Thunb. var. *borealis*)	
		Mountain ash (*Sorbus alnifolia* Koch)	
		Pink mountain cherry (*Prunus sargentii* Rehd.)	
		Cherry (*Prunus ssiori* Schmidt)	
		Painted maple (*Acer mono* Max. var. *velutinum* Boiss.)	
		Maple (*Acer mayrii* Schwerin)	
		Japanese linden (*Tilia japonica* Simk.)	
		Linden (*Tilia maximowicziana* Shira.)	
		Katsura tree (*Cercidiphyllum japonicum* S. et Z.)	
		White oak (Daimyo oak) (*Quercus dentata* Thunb.)	
		FROM 1,000 TO 2,000 FEET IN ELEVATION	
	Conifers	White fir (*Abies mayriana* M. et K.)	
		Japanese yew (*Taxus cuspidata* S. et Z.)	
		Japanese larch (*Larix kaempferi* Sarg.)	
		Yedo Yezo spruce (Hondo spruce) (*Picea yezoensis* Carr.)	
		Glehn's spruce (*Picea glehni* Mast.)	
		Spruce (*Picea excelsa* Link.)	

		Sakhalin fir (*Abies sachilenensis* Mast.)	Sometimes found with undergrowth of dwarf bamboo on flat, wet soil.
	Deciduous Broadleaved Species	Erman's birch (*Betula ermanii* Cham.)	Grows to about 30 feet at this altitude.
		Birch (*Betula maximowicziana* Reg.)	
		Japanese cucumber tree (Silver magnolia) (*Magnolia obovata* Thunb.)	Sometimes is intermixed with birch forests.
		Alder (*Alnus hirsuta Turcz.*)	
		Pink mountain cherry (*Prunus sargentii* Rehd.)	
		Cherry (*Prunus ssiori* Schmidt)	
		Miyami cherry (*Prunus maximowiczii* Rupr.)	
		Cork tree (*Phellodendron sachalinense* Sarg.)	
		Japanese linden (*Tilia japonica* Simk.)	
		Linden (*Tilia maximowicziana* Shira.)	
		"Hari-giri" (*Kalopanax ricinifolium* Miq.)	
		Japanese hop-hornbeam (*Ostrya japonica* Sarg.)	
		Dogwood (*Cornus controversa* Hemsl.)	
		Ash (*Fraxinus sieboldiana* Bl.)	
		Wild mulberry (*Morus bombycis* Koidz.)	
		Elder (*Sambucus buergeriana*)	
		Azalea (*Rhododendron albrechtii* Max.)	
		Currant (*Ribes latifolium* Jancz.)	
		Swamp red currant (*Ribes triste* Pall.)	
		Mountain ash (*Sorbus alnifolia* Koch)	Noted especially on Rebun-jima, intermixed with birch.
		Mountain ash (*Sorbus commixta* Hedl.)	
		Mountain ash (*Sorbus matsumura* Koehne)	
		Japanese poison ivy (*Rhus ambigua*)	
		FROM 2,000 TO 5,000 FEET IN ELEVATION	
Sub-Alpine Zone	Deciduous Broadleaved Species	Erman's birch (*Betula ermanii* Cham.)	Proportion of birch is greater on higher elevations of this zone.
		Japanese white oak (Water oak) (*Quercus crispula* Bl.)	
		Mountain ash (*Sorbus commixta* Hedl.)	
		Maple (*Acer caudatum* Wall. var. *ukurunduense* Rehd.)	
		Maple (*Acer tschonoskii* Max.)	
		Azalea (*Rhododendron albrechtii* Max.)	
		Azalea (*Rhododendron dahuricum* Linn.)	
		Alpine alder (*Alnus maximowiczii*)	Noted chiefly on Rishiri-jima.
		Berries (*Vaccinum* spp.)	
	Evergreen Broadleaved Species	Rosemary (*Ledum palustre* Linn. var. *yezoense*)	
	Conifer	Dwarf stone pine (*Pinus pumila* Reg.)	Sometimes occurs in pure stands, or with undergrowth of dwarf bamboo.
		ABOVE 5,000 FEET IN ELEVATION	
Alpine Zone	Conifer	Dwarf stone pine (*Pinus pumila* Reg.)	Trunk and branches often grow at nearly horizontal angle, forming a dense carpet.

* Japanese common names used when English names are not available.

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TABLE V—(Continued)

CHARACTERISTIC FOREST SPECIES OF JAPAN

ZONE	CLASS	COMMON AND SCIENTIFIC NAMES *	REMARKS
		REGION: NORTHERN HONSHU (Latitude 37°-41° N.; Longitude 137°-142° E.)	
		BELOW 1,600 FEET IN ELEVATION	
Sea Coasts, Sandy Shores, Lowlands	Conifers	Japanese black pine (*Pinus thunbergii* Parl.) Japanese red pine (*Pinus densiflora* S. et Z.)	
Warm Inland Areas	Deciduous Broad-leaved Species	Acacia (Siris, Silk-tree) ("Nemu-no-ki") (*Albizzia julibrissin* Durazz.) Japanese nettle tree (*Celtis japonica* Planch.) Empress tree ("Kiri") (*Paulownia tomentosa* Steud.) Osier (*Salix integra*) Weigela (*Diervilla japonica* DC. var. *hortensis* Rehd.)	
	Evergreen Broad-leaved Species	Evergreen oaks (*Cyclobalanopsis* spp.) Wild camellia (*Camellia japonica* Linn.) Latifolia (*Eurya japonica* Thunb.) Chinese horse brier (*Smilax china* Linn.)	
	Bamboo	Tall bamboo (*Phyllostachys* spp.)	
		BELOW 3,600 FEET IN ELEVATION	
Deciduous Broadleaved Zone	Deciduous Broad-leaved Species	Siebold's beech (*Fagus crenata* Bl.) Small-leaved oak (*Quercus serrata* Thunb.) Japanese white oak (Water oak) (*Quercus crispula* Bl.) Painted maple (*Acer mono* Max.) Fullmoon maple (*Acer japonicum* Thunb.) Japanese chestnut (*Castanea crenata* S. et Z.) Japanese elm (*Ulmus japonica* Sarg.) Japanese wych elm (*Ulmus laciniata* Mayr.) Katsura tree (*Cercidiphyllum japonicum* S. et Z.) Japanese horse chestnut (*Aesculus turbinata* Bl.) Japanese cucumber tree (Silver magnolia) (*Magnolia obovata* Thunb.) Pink mountain cherry (*Prunus sargentii* Rehd.) White alder (*Clethra barbinervis* S. et Z.) Zelkova (Keaki) (*Zelkova serrata* Mak.) "Hari-giri" (*Kalopanax ricinifolim* Miq.) "Koshiabura" (*Kalopanax sciadophylloides* Harms)	
	Conifers	Japanese red pine (*Pinus densiflora* S. et Z.)	Will grow on dry, barren soil.
		Japanese larch (*Larix kaempferi* Sarg.)	Deciduous.
		Japanese redwood ("Sugi") (*Cryptomeria japonica* D.Don) False arborvitae (*Thujopsis dolabrata* S. et Z.)	Prefer humid climate, fertile soil.
		"Asurobe" (False arborvitae) (*Thujopsis dolobrata* S. et Z. var. *hondai* Mak.)	
		Momi fir (*Abies firma* S. et Z.)	Occurs south of latitude 39° N., and chiefly on Pacific side.
		Japanese short-leaved pine (*Pinus pentaphylla* Mayr.)	Grows sporadically, chiefly in higher regions.
		Japanese arborvitae (*Thuja standishii* Carr.) Japanese yew (*Taxus cuspidata* S. et Z.)	Grow sporadically, mixed with broadleaved species.

ABOVE 3,600 FEET IN ELEVATION

Sub-Alpine Zone	Deciduous Broad-leaved Species	Alpine Alder (*Alnus maximowiczii*)	
		Erman's birch (*Betula ermanii* Cham.)	
		Mountain ash (*Sorbus commixta* Hedl.)	
		Mountain ash (*Sorbus matsumurana* Koehne)	Occur sporadically on Pacific side.
		Osier (*Salix* sp.)	
		Cherry (*Prunus nipponica* Mats.)	
		Maple (*Acer caudatum* Wall. var. *ukurunduense* Rehd.)	
		Maple (*Acer tschonoskii* Max.)	
		Panicle hydrangea ("Nori-utsugi") (*Hydrangea paniculata* Sieb.)	
		Azalea (*Rhododendron* sp.)	
	Conifers	Maries' fir (*Abies mariesii* Mast.)	Dominant species on Japan Sea side.
		Northern Japanese hemlock (*Tsuga diversifolia* Mast.)	
		Japanese short-leaved pine (*Pinus pentaphylla* Mayr.)	Reaches good size in suitable locations; assumes creeping form on high exposed slopes.
		Juniper (*Juniperus sargentii*)	
Alpine Zone	Conifer	Dwarf stone pine (*Pinus pumila* Reg.)	
	Deciduous Broad-leaved Species	Alpine azalea (*Rhododendron* sp.)	Dwarf shrub.

REGION: CENTRAL HONSHU

(Latitude 33°-37° N.; Longitude 135°-140° E.)

BELOW 1,600 FEET IN ELEVATION

Coastal Areas	Conifers	Japanese black pine (*Pinus thunbergii* Parl.)	Most abundant of the coastal trees.
		Japanese red pine (*Pinus densiflora* S. et Z.)	
		Chinese juniper (*Juniperus chinensis* Linn.)	
		Shore juniper (*Juniperus litoralis* Max.)	
Evergreen Broadleaved Zone	Evergreen Broad-leaved Species	Red oak (*Quercus acutissima* Carr.)	
		Live oak (*Quercus phylliraeoides* A. Gray)	
		Evergreen oak (*Cyclobalanopsis stenophylla* Schott.)	
		Evergreen oak (*Cyclobalanopsis acuta* Oerst.)	
		Evergreen oak (*Cyclobalanopsis gilva* Oerst.)	
		Evergreen oak (*Cyclobalanopsis glauca* Oerst.)	
		Red oak (*Shiia sieboldii* Mak.)	
		Camphor tree (*Cinnamomum camphora* Sieb.)	
		Wild camellia (*Camellia japonica* Linn.)	
		Japanese holly (*Ilex crenata* Thunb.)	
		"Yudzuriha" (*Daphniphyllum macropodum* Miq.)	
		"Sakaki" (*Eurya ochnacea* Szysz.)	
		"Mokkoku" (*Ternstroemia mokof* Nakai)	
		Japanese yew (*Taxus cuspidata* S. et Z.)	
		Dog camphor (Laurel) (Tabu tree) (*Machilus thunbergii* S. et Z.)	
	Deciduous Broad-leaved Species	Willows (*Salix* spp.)	
		Japanese poplar (*Populus maximowiczii* Henry)	
		Hornbeam (*Carpinus* spp.)	
		Cherry (*Prunus* spp.)	
		Buckeye (*Aesculus turbinata* Bl.)	
		Zelkova (Keaki) (*Zelkova serrata* Mak.)	
		Ash (*Fraxinus* spp.)	
		Japanese linden (*Tilia japonica* Simk.)	
		Elm (*Ulmus japonica* Sarg.)	
		Beech (*Fagus* spp.)	

* Japanese common names used when English names are not available.

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TABLE V—(Continued)

CHARACTERISTIC FOREST SPECIES OF JAPAN

ZONE	CLASS	COMMON AND SCIENTIFIC NAMES *	REMARKS
		CENTRAL HONSHU, Below 1,600 Feet (Continued)	
	Deciduous Broad-leaved Species (Continued)	Japanese magnolia (*Magnolia kobus* Thunb.) Japanese cucumber tree (Silver magnolia) (*Magnolia obovata* Thunb.) Chinese cork tree (*Phellodendron amurense* Rupr.) Japanese hop-hornbeam (*Ostrya japonica* Sarg.) Empress tree ("Kiri") (*Paulownia tomentosa* Steud.) Acacia (Siris, Silk-tree) ("Nemu-no-ki") (*Albizzia julibrissin* Durazz.)	
	Conifers	Momi fir (*Abies firma* S. et Z.) Japanese red pine (*Pinus densiflora* S. et Z.) Japanese black pine (*Pinus thunbergii* Parl.) Japanese redwood ("Sugi") (*Cryptomeria japonica* D. Don)	
		FROM 1,600 TO 4,600 FEET IN ELEVATION	
Mixed Deciduous Broadleaved and Coniferous Zone	Deciduous Broad-leaved Species	Siebold's beech (*Fagus crenata* Bl.) Japanese beech (*Fagus japonica* Max.) Japanese white oak (Water oak) (*Quercus crispula* Bl.) Small-leaved oak (*Quercus serrata* Thunb.) Painted maple (*Acer mono* Max. var. *velutinum* Boiss.) Hornbeam (*Carpinus* spp.) Birch (*Betula* spp.) Japanese chestnut (*Castanea crenata* S. et Z.) Japanese wingnut (*Pterocarya rhoifolia* S. et Z.) Japanese walnut (*Juglans sieboldiana* Max.) Mountain cherry (*Prunus serrulata* Lindl.) Katsura tree (*Cercidiphyllum japonicum* S. et Z.)	
	Conifers	Japanese redwood ("Sugi") (*Cryptomeria japonica* D. Don) Japanese cypress ("Hinoki") (*Chamaecyparis obtusa* S. et Z.) Sawara cypress (*Chamaecyparis pisifera* S. et Z.) Southern Japanese hemlock (*Tsuga sieboldi* Carr.) Umbrella pine (*Sciadopitys verticillata* S. et Z.) Japanese arborvitae (*Thuja standishii* Carr.) False arborvitae (*Thujopsis dolobrata* S. et Z.) "Asurobe" (False arborvitae) (*Thujopsis dolobrata* S. et Z. var. *hondai* Mak.)	
		Northern Japanese hemlock (*Tsuga diversifolia* Mast.) Japanese short-leaved pine (*Pinus pentaphylla* Mayr.) Korean pine (*Pinus koraiensis* S. et Z.)	Occur in colder parts of this zone.
		ABOVE 4,600 FEET IN ELEVATION	
Cold Coniferous Zone	Conifers	White fir (*Abies* spp.) Nikko fir (*Abies homolepis* S. et Z.) Maries' fir (*Abies mariesii* Mast.) Veitch fir (*Abies veitchii* Lindl.) Northern Japanese hemlock (*Tsuga diversifolia* Mast.)	
		Japanese larch (*Larix kaempferi* Sarg.)	Deciduous. Found above 5,300 feet elevation.
		Hondo spruce (*Picea hondoensis* Rehd.) Tigertail spruce (*Picea polita* Carr.) Alcock's spruce (*Picea bicolor* Mayr.)	

	Deciduous Broad-leaved Species	Erman's birch (*Betula ermanii* Cham.) Mountain ash (*Sorbus commixta* Hedl.) Alpine alder (Japanese mountain alder) (*Alnus tinctoria* Sarg. var. *obtusiloba* Call.)	Stunted or shrubby in form in highest areas.
Alpine Zone	Conifer	Dwarf stone pine (*Pinus pumila* Reg.)	

REGION: SOUTHWESTERN HONSHU

(Latitude 34°-36° N.; Longitude 131°-136° E.)

BELOW 1,600 FEET IN ELEVATION

Coastal Areas, Sand Dunes and Beaches	Conifers	Japanese red pine (*Pinus densiflora* S. et Z.) Japanese black pine (*Pinus thunbergii* S. et Z.)	Abundant.
		Juniper (*Juniperus conferta*)	Occurs in a few places.
Evergreen Broadleaved Zone	Evergreen Broad-leaved Species	Camphor tree (*Cinnamomum camphora* Sieb.) Dog camphor (Laurel) (Tabu tree) (*Machilus thunbergii* S. et Z.) Cinnamon tree (*Cinnamomum japonicum* Sieb.) Evergreen oak (*Cyclobalanopsis acuta* Oerst.) Evergreen oak (*Cyclobalanopsis glauca* Oerst.) Tan oak (*Shiia cuspidata* Mak.) Red oak (*Shiia sieboldii* Mak.) Japanese holm oak (*Quercus phylleraeoides* A. Gray) Ring-cupped oak (*Quercus glauca* Thunb.) Live oak (*Lithocarpus* spp.) Camellia (*Camellia japonica* Linn.) "Naname-no-ki" (*Ilex oldhamii* Miq.) Kusamaki ("Maki") (*Podocarpus macrophyllus* D. Don)	
	Bamboo	Moso bamboo (Tall bamboo) (*Phyllostachys edulis* A. et C. Riv.) Yellow bamboo (China cane) (*Phyllostachys reticulata* C. Koch) "Ha-chiku" (*Phyllostachys nigra* Munro var. *henonis* Mak.) Dwarf bamboo (*Sasa* spp.)	Mixed with hardwoods, or in small pure stands in Hiroshima. Large groves found in Muko-machi.
	Deciduous Broad-leaved Species	Japanese chestnut (*Castanea crenata* S. et Z.) Zelkova (Keaki) (*Zelkova serrata* Mak.) Japanese beech (*Fagus japonica* Max.) Elm (*Ulmus lacinata* Mayr.) Cherry (*Prunus serraluta* Lindl.)	Common on cooler sites such as north slopes and elevations between 1,000 and 2,000 feet.
	Conifers	Momi fir (*Abies firma* S. et Z.) Japanese redwood ("Sugi") (*Cryptomeria japonica* D. Don)	

FROM 1,600 TO 2,000 FEET IN ELEVATION

Deciduous Broadleaved Zone	Deciduous Broad-leaved Species	Cork oak (*Quercus variabilis* Bl.) Japanese white oak (Water oak) (*Quercus crispula* Bl.) Small-leaved oak (*Quercus serrata* Thunb.) Painted maple (*Acer pictum* Thunb.) Ash (*Fraxinus* spp.) Japanese walnut (*Juglans sieboldiana* Max.) Japanese wingnut (*Pterocarya rhoifolia* S. et Z.) White mountain cherry (*Prunus serrulata* Lindl.) Birch (*Betula* spp.) Hornbeam (*Carpinus* spp.)	
	Evergreen Broad-leaved Species	Red oak (*Quercus acutissima* Carr.) Japanese holly (*Ilex crenata* Thunb.) Birdlime tree (Holly) (*Ilex integra* Thunb.) Sumac (*Rhus* spp.)	
	Conifers	Japanese red pine (*Pinus densiflora* S. et Z.) Japanese cypress ("Hinoki") (*Chamaecyparis obtusa* S. et Z.) Southern Japanese hemlock (*Tsuga sieboldii* Carr.)	

* Japanese common names used when English names are not available.

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TABLE V—(Continued)

CHARACTERISTIC FOREST SPECIES OF JAPAN

ZONE	CLASS	COMMON AND SCIENTIFIC NAMES *	REMARKS
		REGION: SHIKOKU (Latitude 33°-34° 30′ N.; Longitude 132°-135° E.)	
		BELOW 2,300 FEET IN ELEVATION	
Evergreen Broadleaved Zone		Banyan tree (*Ficus superba*)	Occurs in extreme south at Muroto and Ashizuri.
	Evergreen Broadleaved Species	Parasol tree (Umbrella tree) (*Firmiana plantanifolia* S. et E.) Magnolia (*Michelia compressa* Sarg.)	Tropical or warm climate species.
		Euphorbia (*Daphniphyllum glaucescens* Hort.)	
		Japanese wax tree (*Rhus succedana* Linn.)	Common in southwestern part of Shikoku; poisonous.
		Camphor tree (*Cinnamomum camphora* Sieb.) Camellia (*Camellia japonica* Linn.)	
	Deciduous Broadleaved Species	Empress tree ("Kiri") (*Paulownia tomentosa* Steud.) Japanese chestnut (*Castanea crenata* S. et Z.) Zelkova (Keaki) (*Zelkova serrata* Thunb.)	
	Conifers	Japanese red pine (*Pinus densiflora* S. et Z.) Southern Japanese hemlock (*Tsuga sieboldii* Carr.) Japanese redwood ("Sugi") (*Cryptomeria japonica* D. Don) Japanese cypress ("Hinoki") (*Chamaecyparis obtusa* S. et Z.)	
	Bamboo	Moso bamboo (Tall bamboo) (*Phyllostachys edulis* A. et C. Riv.) Yellow bamboo (China cane) (*Phyllostachys reticulata* C. Koch) "Ha-chiku" (*Phyllostachys nigra* Munro var. *henonsis* Mak.)	Scattered throughout this island. Most common along streams and on rolling and hilly areas at bases of steep lithosols.
		FROM 2,300 TO 6,000 FEET IN ELEVATION	
Mixed Evergreen and Deciduous Zone	Conifers	Japanese black pine (*Pinus thunbergii* Parl.) Momi fir (*Abies firma* S. et Z.)	Occur in almost pure stands in Kagawa and northern Ehime Prefectures, and on many islands of the Inland Sea; mixed with other species throughout Shikoku.
	Evergreen Broadleaved Species	Red oak (*Shiia sieboldii* Mak.) Tan oak (*Shiia cuspidata* Mak.) Live oak (*Quercus phylliraeoides* A. Gray)	
	Deciduous Broadleaved Species	Small-leaved oak (*Quercus serrata* Thunb.) Cork oak (*Quercus variabilis* Bl.) Siebold's beech (*Fagus crenata* Bl.) Japanese beech (*Fagus japonica* Max.) Japanese magnolia (*Magnolia kobus* Thunb.)	
		ABOVE 6,000 FEET IN ELEVATION	
		Birch (*Betula sikokiana* Nakai)	

REGION: KYUSHU

(Latitude 31°-34° N.; Longitude 129°-132° E.)

BELOW 2,800 FEET IN ELEVATION

Coastal Areas, Sand Dunes and Beaches		Japanese black pine (*Pinus thunbergii* Parl.)	
		Mangrove (*Kandelia candele* Merr.)	Found in small amounts on muddy estuaries; presumably brought from Ryukyus.
		Vitex rotundiflora	A creeping shrub.
Evergreen Broad-leaved Zone		Banyan tree (*Ficus superba*) Japanese fern palm (Japanese sago palm) (*Cycas revoluta* Thunb.) Fountain palm (*Livistona subglobosa* Mart.)	Grow in southern Kyushu and small islands to the south.
	Evergreen Broad-leaved Species	Evergreen oak (*Cyclobalanopsis stenophylla* Schott.) Evergreen oak (*Cyclobalanopsis acuta* Oerst.) Evergreen oak (*Cyclobalanopsis gilva* Oerst.) Evergreen oak (*Cyclobalanopsis glauca* Oerst.) Live oak (*Quercus phylliraeoides* A. Gray) Edible stone oak (*Lithocarpus edulis* Nakai) Dog camphor (Laurel) (Tabu tree) (*Machilus thunbergii* S. et Z.) Witch hazel (*Distylium racemosum* S. et Z.)	
	Deciduous Broad-leaved Species	Japanese chestnut (*Castanea crenata* S. et Z.) Zelkova (Keaki) (*Zelkova serrata* Mak.)	Occur in colder parts of the zone.
	Bamboo	Moso bamboo (Tall bamboo) (*Phyllostachys edulis* A. et C. Riv.)	

ABOVE 2,800 FEET IN ELEVATION

Deciduous Broad-leaved Zone	Deciduous Broad-leaved Species	Hornbeam (*Carpinus* spp.) Ash (*Fraxinus* spp.) Japanese linden (*Tilia japonica* Simk.) Elm (*Ulmus* spp.) Siebold's beech (*Fagus crenata* Bl.) Japanese snowbell (*Styrax japonicus* S. et Z.) Barberry (*Berberis thunbergii* DC.) Chinese or Japanese pepper tree (Prickly ash) (*Xanthoxylum piperitum* DC.) Tara vine ("Kokuwa") (*Actinidia arguta* Planch.) Wisteria (*Wisteria floribunda* DC.)	
	Evergreen Broad-leaved Species	Evergreen oaks (*Cyclobalanopsis, Quercus, Lithocarpus, Shiia* spp.) Plum-yew (*Cephalotaxus drupacea* S. et Z.) Birdlime tree (Holly) (*Ilex integra* Thunb.) Anise (*Illicium religiosum* S. et Z.) Spindle tree (*Euonymus oxyphyllus* Miq.) Privet (*Ligustrum* spp.) Japanese ivy (*Hedera rhombea* S. et Z.)	
	Conifers	Japanese red pine (*Pinus densiflora* S. et Z.) Umbrella pine (*Sciadopitys verticillata* S. et Z.) Japanese Douglas fir (*Pseudotsuga japonica* Beis.) Momi fir (*Abies firma* S. et Z.) Southern Japanese hemlock (*Tsugi sieboldii* Carr.) Japanese redwood ("Sugi") (*Cryptomeria japonica* D. Don) Japanese cypress ("Hinoki") (*Chamaecyparis obtusa* S. et Z.) Japanese torreya (*Torreya nucifera* S. et Z.)	

Source: Based on Data from Ministry of Agriculture and Forestry, Japan, and from Natural Resources Section, GHQ, SCAP.

* Japanese common names used when English names are not available.

TABLE VI

CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	REGION: HOKKAIDO (Latitude 41°-46° N.; Longitude 140°-146° E.)	
Sedge	*Carex subspathacea* Wormsk.	Dominant plants in salt marshes along northeastern, eastern and southeastern coasts.
Sea milkwort	*Glaux maritima* Linn.	
Pacific cinquefoil	*Potentilla pacifica* How.	
	Puccinellia kurilensis Honda	
Saltwort	*Salicornia* sp.	
Sandwort	*Spergularia salina* J. et C.P.	
Arrowgrass	*Triglochin maritimum* Linn.	
	Ammodenia oblongifolia Ryd.	Characteristic plants and shrubs on sandy beaches and dunes.
Japanese rock-cress	*Arabis japonica* A. Gray	
Japanese mugwort	*Artemisia asiatica* Nakai	
	Artemisia littoricola Kit.	
Dusty miller	*Artemisia stellerinana* Bess.	
Shore bindweed	*Calystegia soldanella* R. et S.	
Sedge	*Carex macrocephala* Willd.	
Sedge	*Carex pumila* Thunb.	
Downy lyme grass (Common dune wild rye)	*Elymus mollis* Trin.	
Cranesbill	*Geranium miyabei* Nakai	
	Glehnia littoralis Fr. Schmidt	
Shore lettuce	*Ixeris repens* A. Gray	
Rush	*Juncus haenkei* Meyer	
Rush	*Juncus yokoscensis* Sat.	
Japanese Beach pea	*Lathyrus japonicus* Willd.	
Japanese toadflax	*Linaria japonica* Miq.	
Asiatic lungwort	*Mertensia maritima* S. F. Gray subsp. *asiatica* Tak.	
	Messerschmidia sibirica Linn.	
Tumbleweed	*Salsola komarovi* Iljin	
Ladybell	*Adenophora thunbergiana* Kudo form. *totoki* Hiyama	Herbage on areas immediately inland from coastal sand dunes.
"Otoko-yomogi"	*Artemisia japonica* Thunb.	
	Artemisia koidzumii Nakai	
Langsdorff's reed grass	*Calamogrostis langsdorffii* Trin.	
	Coelopleurum gmelini Ledeb.	
Dragonhead	*Dracocephalum argunense* Fisch.	
Dahurian lyme grass	*Elymus dahuricus* Turcz.	
Red fescue	*Festuca rubra* Linn.	
Lady's bedstraw	*Galium verum* Linn.	
Cranesbill	*Geranium yezoense* F. et S.	
Candlestick lily	*Lilium dauricum* Ker-Gawl.	
Kamchatkan plantain	*Plantago camtschatica* Cham.	
Solomon's seal	*Polygonatum humile* Fisch.	
Rose	*Rosa rugosa* Thunb.	
Skullcap of Hokkaido	*Scutellaria yezoensis* Kudo	
Goldenrod	*Solidago decurrens* Lour.	
Golden pea	*Thermopsis lanceolata* R. Br.	
Rush	*Juncus gracillimus* K. et G.	Among plants generally found growing in undeveloped areas of boulders, gravel, and pebbles along coasts or streams.
	Ligusticum hultenii Fern.	
Groundsel	*Senecio pseudo-arnica* Less.	
"Kasa-suge" (Sedge)	*Carex dispalata* Boott.	
Groundsel	*Senecio cannabifolius* Less.	

TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	HOKKAIDO—(Continued)	
Siberian chives	*Allium schoenoprasum* Linn. var. *sibiricum* Hartm.	
	Artemisia iwayomogi Kit.	
	Artemisia keiskeana Miq.	
Fiber plant	*Boehmeria biloba* Ker-Gawl.	
Chickweed	*Cerastium schmidtianum* Tak.	
Arctic chrysanthemum	*Chrysanthemum arcticum* Linn.	
Pink	*Dianthus superbus* Linn.	
Whitlowgrass	*Draba borealis* DC. var. *kurilensis* Fr. Schmidt	Plants characteristic of coastal cliffs.
Sheep's fescue	*Festuca ovina* Linn.	
Sedum or Stonecrop	*Orostachys aggregeatus* Hara	
Cinquefoil	*Potentilla megalantha* Tak.	
Primrose	*Primula fauriei* Fr.	
	Rhodiola stephani T. et M.	
"Daimonji-so"	*Saxifraga fortunei* Hook	
Kamchatkan sedum	*Sedum kamtschaticum* F. et M.	
Campion	*Silene foliosa* Max.	
Fern	*Woodsia polystichoides* Eaton	
	Chrysanthemum littorale	
	Cochlearia oblongifolia DC.	
"Oni-yabusotetsu" (Holly fern)	*Cyrtomium falcatum* J. Smith	Plants found in rather restricted spots on coastal cliffs.
Fleabane	*Erigeron hirsutum* M. et M.	
Wood betony (Lousewort)	*Pedicularis venusta* Schang var. *schmidtii* Nakai	
Sedum	*Sedum cauticolum* Praeg.	
Starwort	*Stellaria ruscifolia* Willd.	
Akebia	*Akebia trifoliata* Koid.	
Groundnut	*Apios fortunei* Max.	
	Ardisia japonica Bl.	
Orchid	*Calanthe reflexa* Max.	
Orchid	*Cymbidium virescens* Lindl.	
Woodfern	*Dryopteris dickinsii* C. Christ.	
	Dryopteris sabaei C. Christ.	Warmer region species found chiefly on Okushiri-jima
	Dryopteris uniformis Mak.	
Ivy	*Hedera tobleri* Nakai	
	Lepisorus onoei Ching	
Honeysuckle	*Lonicera strophiophora* Fr.	
	Phymatopsis hastata Kit.	
Club moss	*Selaginella involvens* Spring var. *minor*	
	Thelypteris japonica Ching	
	Wasabia sp.	
Siberian yarrow	*Achillea sibirica* Ledeb.	
Yarrow	*Achillea speciosa* Henck.	
Monkshood	*Aconitum subcuneatum* Nakai	
Goatsbeard	*Aruncus sylvester* Kost.	Plants found on gentle inland slopes adjacent to coastal areas.
Hare's ear	*Bupleurum aureum* Fisch.	
Lady's bedstraw	*Galium verum* Linn.	
Day lily	*Hemerocallis niddendorfii* T. et M.	
Inula	*Inula kitamuraua* Tat.	
	Pleurospermum kamtschaticum Hoff.	
Meadow rue	*Thalictrum thunbergii* DC.	
"Susuki" (Chinese silvergrass)	*Miscanthus sinensis* And.	Grows in dry areas throughout Hokkaido.
Langsdorff's reed grass	*Calamagrostis langsdorffii* Trin.	On inland plains in dry areas.
Lily-of-the-valley	*Convallaria majalis* Linn.	
Cogon grass	*Imperata cylindrica* Beauv. var. *koenigii* D. et S.	
Japanese bush clover	*Lespedeza bicolor* var. Turcz. *japonica* Nakai	

[*Continued next page*]

TABLE VI—(Continued)

CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	HOKKAIDO—(Continued)	
Angelica	*Angelica genuflexa* Nutt.	
Angelica	*Angelica ursina* Max.	
	Anthriscus nemorosa Spreng.	
Aster	*Aster glehni* Fr. Schmidt	
Cacalia	*Cacalia hastata* Linn.	
Giant marsh marigold	*Caltha fistulosa* N. Schip.	
Kamchatkan thistle	*Cirsium kamtschaticum* Ledeb.	
Corydalis	*Corydalis ambigua* C. et S.	
Joe pye weed of Sakhalin (Boneset)	*Eupatorium sachalinense* Mak.	Vegetation characteristic of fertile, humid inland plains.
Kamchatkan meadow sweet	*Filipendula kamtschatica* Max.	
Kamchatkan black lily	*Fritillaria camschatcensis* Ker-Gawl.	
Yellow Star-of-Bethlehem	*Gagea lutea* Ker.	
Mannagrass	*Glyceria leptolepis* Ohwi	
Yellow skunkcabbage	*Lysichiton camtschatcense* Schott	
Giant butter bur	*Petasites amplus* Kit.	
Giant butter bur	*Petasites japonica* Miq. var. *giganteus* Hort.	
Ostrich fern	*Pteris struthiopteris*	
Sacaline	*Reynoutria sachalinensis* Nakai	
Kamchatkan trillium	*Trillium kamtschaticum* Pallas	
Nettle	*Urtica takedana* Ohwi	
False hellebore	*Veratrum grandiflorum* Loes.	
Water plantain	*Alisma orientale* Juzep.	
	Amitostigma kinoshitai Schlecht	
Amsonia	*Amsonia elliptica* R. et S.	
Aster	*Aster rugulosus* Max.	
Bur-marigold	*Bidens radiata* Thuill.	
"Ezo-azesuge"	*Carex augustinowiczii* Meinsh.	
Sedge	*Carex koidzumi* Honda	
Sedge	*Carex limosa* Linn.	
Sedge	*Carex lyngbyei* Hornem.	
Sedge	*Carex michauxiana* Boeck	
Sedge	*Carex pseudo-curaica* Fr. Schmidt	
Sedge	*Carex rhynchophysa* C. A. Meyer	
Sedge	*Carex tsuishikarensis* Keto	
Leatherleaf	*Chamaedaphyne calyculata* Moench	
Thistle	*Cirsium pectinellum* A. Gray	
Sundew (Dew plant)	*Drosera angelica* Hud.	
Horsetail	*Equisetum palustre* Linn.	
Pipewort	*Eriocaulon monococcon* Nakai	
Cottongrass	*Eriophorum vaginatum* Linn.	
Joe pye weed (Boneset)	*Eupatorium lindleyanum* DC.	Vegetation characteristic of inland swamps and bogs.
	Gale tomentosa	
Mannagrass	*Glyceria leptolepis*	
Plantain lily	*Hosta longissima* Honda var. *brevifolia* F. Maek.	
Plantain lily	*Hosta rectifolia* Nakai	
Iris	*Iris setosa* Pall.	
Lobelia	*Lobelia sessiliflora* Lamb.	
Ground pine	*Lycopodium inundatum* Linn.	
Loosestrife	*Lysimachia davurica* Ledeb form. *latifolia* Hara	
Spiked or Purple loosestrife (Black blood)	*Lythrum anceps* Hort.	
	Moliniopsis japonica Hay.	
Loosestrife	*Naumburgia thyrsiflora* Reich.	
Asiatic cinnamon fern	*Osmunda cinnamomea* Linn. var. *asiatica*	
Common reed	*Phragmites communis* Linn.	
Common reed	*Phragmites longivalvis* Steud.	
White beaked-rush	*Rhynchospora alba* Vahl.	
Beaked-rush	*Rhynchospora fauriei* Fr.	
Burnet	*Sanguisorba tenuifolia* Fisch. var. *alba* T. et M.	
Bog arrowgrass	*Scheuchzeria palustris* Linn.	
St. John's wort	*Triadenum japonicum* Mak.	
Bladderwort	*Utricularia affinis* Wight	
Kamchatkan violet	*Viola kamtschadalorum* B. et H.	

TABLE VI—(Continued)

CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	HOKKAIDO—(Continued)	
Bog rosemary	*Andromeda polifolia* Linn.	Typical of sphagnum bogs.
Sedge	*Carex middendorfii*	
Goldthread	*Coptis trifolia* Salisb.	
Sundew (Dew-plant)	*Drosera rotundifolia* Linn.	
Crowberry	*Empetrum nigrum* Linn. var. *japonicum* Hara	
Holly	*Ilex radicans* Nakai	
Wild rosemary of Hokkaido	*Ledum palustre* Linn. var. *yezoense* Nakai	
Ground pine	*Lycopodium obscurum* Linn. form. *strictum*	
Cranberry	*Oxycoccus macrocarpus* Turcz.	
Cranberry	*Oxycoccus quadripetala* Gil.	
Grass of Parnassus	*Parnassia palustris* Linn.	
Fringed orchis	*Platanthera tipuloides* Lindl.	
Japanese pogonia (Orchid)	*Pogonia japonica*	
Cloudberry	*Rubus chamaemorus* Linn.	
Chickweed (Wintergreen)	*Trientalis europaea* Linn. var. *arctica* Ledeb.	
Violet	*Viola semilunaris* W. Becker	
Everlasting	*Anaphalis margaritacea* B. et H.	Found on mountainsides and high plains.
Angelica	*Angelica anomala* Lall.	
Mountain mugwort	*Artemisia montana* Pamp.	
Asparagus fern	*Asparagus schoberioides* Kunth.	
Aster	*Aster scaber* Thunb.	
Reed grass (Bush grass)	*Calamagrostis epigejos* Roth.	
Lily-of-the-valley	*Convallaria majalis* Linn.	
Hawkweed	*Hieracium umbellatum* Linn.	
Inula	*Inula kitamurana* Tat.	
Bush clover	*Lespedeza* spp.	
Loosestrife	*Lysimachia clethroides* Duby	
Mountain parsley	*Patrinia scabiosaefolia* Fisch.	
Hawkweed picris	*Picris hieracioides* Linn.	
Balloon flower	*Platycodon glaucus* Nakai	
Cinquefoil	*Potentilla amurensis* Max.	
Western bracken	*Pteridium aquilinum* Kuhn var. *osmundaceam* Christ.	
Dwarf bamboo	*Sasa apoiensis* Nakai	
Dwarf bamboo	*Sasa nipponica* M. et S.	
Meadow rue	*Thalictrum thunbergii* DC.	
Cohosh (Baneberry)	*Actaea* spp.	Some species found on Rishiri-jima. In addition to these, the different habitats of Rishiri-jima such as rocky, sandy, wet, dry, or mossy, produce a wide variety of alpine plants.
Anemone	*Anemone* spp.	
Bunch flower	*Chamaepericlimenum canadense* A. et G.	
Nightshade	*Circaea alpina*	
Clintonia	*Clintonia udensis* T. et M.	
	Majanthemum spp.	
	Rubus pseudo-japonicus Koid.	
Trillium	*Trillium* spp.	
Angelica	*Angelica genuflexa* Nutt.	Rebun-jima is not mountainous and most forests have been cut; herbaceous undergrowths include the species here mentioned, but the most important vegetation of the hilly areas and western cliffs is the alpine mat herbage
Cacalia	*Cacalia hastata* Linn.	
Nightshade	*Circaea alpina*	
	Galium trifloriforme Kom.	
	Hydrangea opuloides	
	Hydrangea paniculata Sieb.	
Holly	*Ilex radicans* Nakai	
Holly	*Ilex rugosa* Fr. Schmidt	
Touch-me-not	*Impatiens noli-tangere* Linn.	
	Majanthemum bifolium	
	Majanthemum dilatatum	
Wood sorrel	*Oxalis acetosella* Linn.	
Sumac	*Rhus* sp.	
Currant (Gooseberry)	*Ribes* sp.	
Dwarf bamboo (of Kuriles)	*Sasa kurilensis* M. et S.	
	Skimmia sp.	
Berry	*Vaccinium smallii* A. Gray	
Violet	*Viola selkirkii* Pursh.	

[*Continued next page*]

TABLE VI—(Continued)

CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	REGION: NORTHERN HONSHU (Latitude 37°-41° N.; Longitude 137°-142° E.)	
Rose	*Rosa rugosa* Thunb.	On Japan Sea coastal sand dunes as far north as northern Yamagata Prefecture (warm Japanese current from south affects vegetation).
Asiatic lungwort	*Mertensia maritima* S. F. Gray subsp. *asiatica* Tak.	On the Pacific sand dunes as far south as midway of the coast of Iwate Prefecture (cold Okhotsk current affects vegetation).
Kamchatkan plantain	*Plantago camtschatica* Cham.	Other plants found on sandy shores toward the north
Groundsel	*Senecio pseudo-arnica* Less.	
	Artemisia capillaries Thunb.	Other plants found on sandy beaches toward the south.
Shore bindweed	*Calystegia soldanella* R. et S.	
Sedge	*Carex kobomugi* Ohwi	
Sedge	*Carex punila* Thunb.	
Bermuda grass	*Cynodon dactylon* Pers.	
Downy lyme grass (Common dune wild rye)	*Elymus mollis* Trin.	
	Glehnia littoralis Fr. Schmidt	
	Ischaemum anthephroides Miq. var. *eriostachyum* Honda	
Shore lettuce	*Ixeris repens* A. Gray	
Japanese beach pea	*Lathyrus japonicus* Willd.	
	Messerschmidia sibirica Linn.	
Arctic chrysanthemum	*Chrysanthemum arcticum* Linn.	Flowers of precipitous Pacific cliffs.
Nippon daisy	*Chrysanthemum nipponicum* Mat.	
"Sukashi-yuri"	*Lilium elegans* Thunb.	
Bog bean	*Menyanthes trifoliata* Linn.	Characteristic of northernmost stream banks or bogs.
Reed canary grass	*Phalaris arundinacea* Linn.	
Common reed	*Phragmites communis* Linn.	
Common cat-tail	*Typha latifolia* Linn.	
Indian rice (Wild rice)	*Zizania latifolia* Turcz.	
Ladybell	*Adenophora thunbergiana* Kudo form. *totoki* Hiyama	Found on inland slopes usually near seacoast.
Giant butter bur	*Petasites amplus* Kit.	On fertile, humid inland plains.
"Kasa-suge" (Sedge)	*Carex lanceolata* Boott.	Widespread in Northern Honshu.
"Shiba-suge" (Sedge)	*Carex nervata* F. et S.	
Japanese goldenrod	*Solidago japonica* Kit.	
Plantain lily	*Hosta longissima* Honda var. *brevifolia* F. Maek.	Vegetation noted in moist and shady areas.
Loosestrife	*Lysimachia clethroides* Duby	
Daburian patrinia	*Patrinia scabiosaefolia* Fisch.	
Dwarf bamboo (Common cane)	*Arundinaria communis* Mak.	These and other dwarf bamboo genera and species are found in this region. All dwarf bamboo is called "Sasa." Sometimes it forms here impenetrable thickets.
"Adzuma-nezasa"	*Pleioblastus chino* Mak.	
"Kuma-zasa"	*Sasa albo-marginata* M. et S.	

TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	NORTHERN HONSHU—(Continued)	
Dwarf lilyturf	*Ophiopogon japonicus* Ker-Gawl.	Ground cover which stands well during dry periods.
White clover (Dutch clover)	*Trifolium repens* Linn.	Thick stands found on steep mountain slopes.
Siberian bush clover	*Lespedeza bicolor* Turcz.	Other legumes growing wild.
Thunberg's kudzu bean	*Pueraria thunbergiana* Benth.	
"Susuki" (Chinese silvergrass)	*Miscanthus sinensis* And.	Chief grass in dry land regions.
Bentgrass	*Agrostis matsumurae* Hack.	Vegetation noted chiefly in southwestern part of Northern Honshu (Niigata Prefecture).
Aster	*Aster scaber* Thunb.	
"O-garukaya" (Oil grass)	*Cymbopogon goeringii* Honda	
"Otoko-yomogi"	*Artemisia japonica* Thunb.	Found in dry-land fields and along roadways.
	Artemisia keiskeana Miq.	
	Aster dubius Onno	
	Clematis stans S. et Z.	
Lady's bedstraw	*Galium verum* Linn.	
	Halorrhagis micrantha R. Br.	
Cogon grass	*Imperata cylindrica* Beauv. var. *koenigii* D. et S.	
Inula	*Inula kitamurana* Tat.	
"Niga-na" (a lettuce)	*Ixeris dentata* Nakai	
Japanese bird's-foot trefoil	*Lotus corniculatus* Linn. var. *japonicus* Reg.	
Chinese cinquefoil	*Potentilla chinensis* Ser.	
Western bracken	*Pteridium aquilinum* Kuhn var. *japonica* Nakai	
	Pulsatilla cernua	
Japanese lawn grass	*Zoysia japonica* Steud.	
Cinquefoil	*Potentilla freyniana* Bornm.	Plants found mainly in the eastern or Pacific part of this region.
Selfheal	*Prunella asiatica* Nakai	
"Toda-shiba"	*Arundinella hirta* Tan. var. *ciliata* Koidz.	Plants found mainly in the western or Japan Sea side of this region.
Pennywort	*Hydrocotyle wilfordii* Max.	
"O-aburasusuki"	*Spodiopogon sibiricus* Trin.	
Crowberry	*Empetrum nigrum* Linn. var. *japonicum* Hara	Alpine vegetation of highest peaks.
Alpine azalea	*Rhododendron* spp.	
Dwarf bamboo ("Sasa")	*Sasa* spp.	
	Sieversia pentapetala Gr.	
Cowberry (Mountain cranberry)	*Vaccinium vitis-idaea* Linn. var. *minus* Lodd.	
Siberian yarrow	*Achillea speciosa* Henck.	Cold climate vegetation on Sado-shima in the Japan Sea.
	Artemisia littoricola Kit.	
Downy lyme grass (Common dune wild rye)	*Elymus mollis* Trin.	
Iris	*Iris setosa* Pall.	
"Sukashi-yuri"	*Lilium elegans* Thunb.	
	Rhododendron fauriei	
Rose	*Rosa rugosa* Thunb.	
Brookweed	*Samolus valerandi* Linn. var. *floribundus* Kn.	

[*Continued next page*]

TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	REGION: CENTRAL HONSHU (Latitude 33°-37° N.; Longitude 135°-140° E.)	
Japanese goldenrod	*Solidago japonica* Kit.	In all areas except inland mountain districts.
Aster	*Aster scaber* Thunb.	In most areas except southern coastal zones.
Chain fern	*Woodwardia orientalis* Swartz.	Hangs from steep cliffs in warm areas.
Flowering fern (Royal fern)	*Osmunda japonica* Thunb.	Sunny, damp areas. Unfolded fronds used for food.
Ostrich fern	*Pteris struthiopteria* Nieuw.	
Cinnamon fern	*Osmunda cinnamomea* Linn.	Occurs in damp spots of higher elevations. Edible.
Plaintain lily	*Hosta longissima* Honda var. *brevifolia* F. Maek.	On stream sides and in marshes or any moist shady spots.
Loosestrife	*Lysimachia clethroides* Duby	
Sensitive fern	*Onoclea sensibilis* Linn.	
Dahurian patrinia	*Patrinia scabiosaefolia* Fisch.	
Marsh fern	*Thelypteris palustris* Schott	
Giant butter bur	*Petasites amplus* Kit.	Especially on fertile, humid inland plains.
Moso bamboo	*Phyllostachys edulis* A. et C. Riv.	Chief species of bamboo in Central Honshu. Found along streams in lowlands and foothills.
"Ha-chiku"	*Phyllostachys nigra* var. *henonis* Mak.	
Japanese bamboo (China cane)	*Phyllostachys reticulata* C. Koch	
Dwarf bamboo ("Sasa")	*Arundinaria* spp.	Of the dwarf bamboos, the species of "Sasa" predominate and this name is used for all dwarf bamboos, which may, however, be of other genera. Some grow well in sun, others in shade.
"Adzuma-nezasa"	*Pleioblastus chino* Mak.	
Dwarf bamboo	*Sasa* spp.	
"Kuma-zasa"	*Sasa albo-marginata* M. et S.	
Dwarf bamboo	*Sasamorpha* spp.	
Marsh foxtail	*Alopecurus aequalis* Sobol.	Forage grasses found on poorly drained soils.
American slough grass	*Beckmannia syzigachne* Fern.	
Barnyard grass	*Echinochloa crusgalli* Beauv.	
Rice oat-grass	*Leersia oryzoides* Swartz var. *japonica*	
Reed canary grass	*Phalaris arundinacea* Linn.	
Bentgrass	*Agrostis matsumurae* Hack.	
"O-garukaya" (Oil grass)	*Cymbopogon goeringii* Honda	
Wheat grass	*Agropyrum semicostatum* Nees	Forage grasses which grow in sunny and comparatively dry areas.
Common wild oat	*Avena fatua* Linn.	
Japanese cheat	*Bromus japonicus* Thunb.	
Reed grass	*Calamagrostis arundinacea* Roth var. *sciuroides* Hack.	
Bermuda grass	*Cynodon dactylon* Pers.	
Hairy crab-grass	*Digitaria ciliaris* Pers.	
Goose grass	*Eleusine indica* Gaert.	
Kentucky blue grass	*Poa pratensis* Linn.	
Green foxtail	*Setaria viridis* Beauv.	
Japanese lawn grass	*Zoysia japonica* Steud.	
Mascarene grass	*Zoysia tenuifolia* Willd.	

TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
CENTRAL HONSHU—(Continued)		
Korean lespedeza	*Kummerowia stipulacea* Mak.	Wild legumes.
Japan clover	*Kummerowia striata* Schindl.	
Siberian bush clover	*Lespedeza bicolor* Turcz.	
Sericea lespedeza	*Lespedeza cuneata* G. Don	
Shrub lespedeza	*Lespedeza thunbergii* Nakai	
Thunberg's kudzu bean	*Pueraria thunbergiana* Benth.	
White clover (Dutch clover)	*Trifolium repens* Linn.	
Cogon grass	*Imperata cylindrica* Beauv. var. *koenigii* D. et S.	Dry, sunny plains and slopes. ("Susuki" is the most widespread species of grass. On dry lower elevations usually. Its young leaves eaten by cattle.)
"Susuki" (Chinese silver grass)	*Miscanthus sinensis* And.	
"Kariyasu"	*Miscanthus tinctorius* Hack.	
Western bracken	*Pteridium aquilinum* Kuhn var. *japonica* Nakai	
"Ko-shida" (a fern)	*Dicranopteris dichotoma* Bernh.	Dry, warm regions. Evergreen.
"Urajiro" (a fern)	*Dicranopteris glauca* Robins.	
Dwarf lilyturf	*Ophiopogon japonica* Ker-Gawl.	Ground cover which stands well during dry periods.
Ladybell	*Adenophora thunbergiana* Kudo form. *totoki* Hiyama	Vegetation found mostly in western and southern sections of Central Honshu.
"Todo-shiba" (a grass)	*Arundinella hirta* Tan. var. *ciliata* Koidz.	
"Kasa-suge" (Sedge)	*Carex lanceolata* Boott.	
"Shiba-suge" (a sedge)	*Carex nervata* F. et S.	Vegetation chiefly of eastern sections of Central Honshu.
"Niga-na" (a lettuce)	*Ixeris dentata* Nakai	
Cinquefoil	*Potentilla freyniana* Bornm.	
Selfheal	*Prunella asiatica* Nakai	
Burnet	*Sanguisorbia carnea* Fisch.	
"O-aburasusuki"	*Spodiopogon sibiricus* Trin.	
Fern	*Asplenium viride* Huds.	Sub-alpine vegetation of fields or forest floors.
Fern	*Athyrium alpestre* Ryl.	
Fern	*Athyrium nigropaleaceum*	
Fern	*Athyrium pterorhachis* Christ.	
Fern	*Cystopteris fragilis* Bernh.	
Fern	*Polystichum microchlamys* Kod.	
Fern	*Rumohra maximowiczii* Ching	
Fern	*Rumohra mutica* Ching	
REGION: SOUTHWESTERN HONSHU (Latitude 34°-36° N.; Longitude 131°-136° E.)		
Speedwell	*Veronica incana* Linn.	On coastal area of Japan Sea side.
St. John's lily	*Crinum asiaticum* Linn. var. *japonicum* Baker	At southern tip of Kii-hanto.
Groundsel	*Senecio scandens* Buch.-Ham.	
Japanese mugwort	*Artemisia asiatica* Nakai	Vegetation characteristic of sandy beaches.
	Artemisia capillaris Thunb.	
"Otoko-yomogi"	*Artemisia japonica* Thunb.	
Shore bindweed	*Calystegia soldanella* R. et S.	
Sedge	*Carex kobomugi* Ohwi	
Sedge	*Carex pumila* Thunb.	
Bermuda grass	*Cynodon dactylon* Pers.	
	Ischaenum anthephroides Miq.	
Shore lettuce	*Ixeris repens* A. Gray	
Vitex	*Vitex rotundifolia* Linn.	

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TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	SOUTHWESTERN HONSHU—(Continued)	
Ladybell	*Adenophora thunbergiana* Kudo form. *totoki* Hiyama	On inland slopes near seacoast.
Giant butter bur	*Petasites amplus* Kit.	On fertile, humid inland plains.
Plantain lily	*Hosta longissima* Honda var. *brevifolia* F. Maek.	Moist, shady spots preferred.
Loosestrife	*Lysimachia clethroides* Duby	
Dahurian patrinia	*Patrinia scabiosaefolia* Fisch.	
Japanese raspberry	*Rubus parvifolius* Linn. var. *triphyllus* Nakai	
Marsh foxtail	*Alopecurus aequalis* Sobol.	Forage grasses found on poorly drained soils.
American slough grass	*Beckmannia syzigachne* Fern.	
Barnyard grass	*Echinochloa crusgalli* Beauv.	
Rice cut-grass	*Leersia oryzoides* Swartz var. *japonica*	
Reed canary grass	*Phalaris arundinacea* Linn.	
"O-garukaya" (Oil grass)	*Cymbopogon goeringii* Honda	
"Susuki" (Chinese silvergrass)	*Miscanthus sinensis* And.	Most widespread species of grass. Propagates rapidly. Found on dry lower elevations. Young leaves eaten by cattle. Mature leaves unfit for forage, but used for thatched roofs.
Drooping wheat grass	*Agropyron semicostatum* Nees	Forage grasses typical of sunny and comparatively dry regions.
Common wild oat	*Avena fatua* Linn.	
Japanese cheat	*Bromus japonicus* Thunb.	
Reed grass	*Calamagrostis arundinacea* Roth var. *sciuroides* Hack.	
Bermuda grass	*Cynodon dactylon* Pers.	
Hairy crab grass	*Digitaria ciliaris* Pers.	
Goose grass	*Eleusine indica* Gaert.	
Sparrow's millet	*Eriochloa villosa* Kunth	
Cogon grass	*Imperata cylindrica* Beauv.	
Purple bulrush millet	*Pennisetum purpurascens*	
Kentucky blue grass	*Poa pratensis* Linn.	
Green foxtail	*Setaria viridis* Beauv.	
Japanese kangaroo grass	*Themeda japonica* Tan.	
Bifid yellow oat grass	*Trisetum bifidum* Ohwi	
Korean lespedeza	*Kummerowia stipulacea* Mak.	Among legumes which grow wild.
Japan clover	*Kummerowia striata* Schind.	
Sericea lespedeza	*Lespedeza cuneata* G. Don	
"Maruba-hagi"	*Lespedeza cyrtobotrya* Miq.	
Shrub lespedeza	*Lespedeza thunbergii* Nakai	
White clover (Dutch clover)	*Trifolium repens* Linn.	
Western bracken	*Pteridium aquilinum* Kuhn var. *japonica* Nakai	In high dry fields and on roadsides.
Dwarf lilyturf	*Ophiopogon japonicus* Ker-Gawl.	Ground cover which stands well during dry periods. Found chiefly toward north or Japan Sea area.
Dwarf bamboo (common cane)	*Arundinaria communis* Mak.	Sunny slopes, at higher elevations, preferred by some of these species. Cattle eat only young shoots. Vigorous growth on wasteland competes with pasture grasses.
Dwarf bamboo	*Pleioblastus* spp.	
"Kuma-zasa"	*Sasa albo-marginata* M. et S.	
Veitch sasa	*Sasa veitchi* Rehd.	
Dwarf bamboo	*Sasamorpha* spp.	

TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	SOUTHWESTERN HONSHU—(Continued)	
Burdock	*Arcterica nana* Mak.	Alpine vegetation. May grow on highest peaks.
	Gaultheria miqueliana Tak.	
Mountain heath	*Phyllodoce nipponica* Mak.	
Cowberry (Mountain cranberry)	*Vaccinium vitis-idaea* Linn. var. *minus* Lodd.	
"Toda-shiba"	*Arundinella hirta* Tan. var. *ciliata* Koidz.	Noted chiefly in the areas toward the Japan Sea.
Aster	*Aster scaber* Thunb.	
"Kasa-suge" (Sedge)	*Carex lanceolata* Boott.	
Japanese goldenrod	*Solidago japonica* Kit.	
Burnet	*Sanguisorba carnea* Fisch.	Noted in the areas near the Inland Sea.
Greenbrier ("Shiwote")	*Smilax nipponica* Miq.	
Horseweed fleabane	*Erigeron canadensis* Linn.	
"Niga-na" (a lettuce)	*Ixeris dentata* Nakai	
Rose multiflora	*Rosa polyantha* S. et Z.	
	REGION: SHIKOKU (Latitude 33°-34° 30′ N.; Longitude 132°-135° E.)	
Japanese mugwort	*Artemisia asiatica* Nakai	Characteristic of most sandy beaches and dunes.
Eupatorium	*Eupatorium lindleyanum* DC.	Plants growing in moist and shady spots, or swamps and bogs.
Loosestrife	*Lysimachia clethroides* Duby	
Dahurian patrinia	*Patrinia scabiosaefolia* Fisch.	
Japanese raspberry	*Rubus parvifolius* Linn. var. *triphyllus* Nakai	
Giant butter bur	*Petasites amplus* Kit.	Found on fertile, humid inland plains.
Dwarf bamboo ("Sasa")	*Arundinaria communis* Mak.	Of whatever genera, all dwarf bamboo is called "Sasa." This species of *Arundinaria* is found mainly in the southern parts of Shikoku.
"Susuki" (Chinese silvergrass)	*Miscanthus sinensis* And.	Most widespread species of grass.
Cogon grass	*Imperata cylindrica* Beauv. var. *koenigii* D. et Z.	Found in fields, along roadways, on sunny stream banks and gentle slopes.
Japanese bush clover	*Lespedeza bicolor* Turcz. var. *japonica* Nakai	
Sericea lespedeza	*Lespedeza cuneata* G. Don	
"Maruba-hagi"	*Lespedeza cyrtobotrya* Miq.	
Western bracken	*Pteridium aquilinum* Kuhn var. *japonica* Nakai	
Thunberg's kudzu bean	*Pueraria thunbergiana* Benth.	
Burnet	*Sanguisorbia carnea* Fisch.	
Greenbrier ("Shiwote")	*Smilax nipponica* Miq.	
Japanese lawn grass	*Zoysia japonica* Steud.	
"O-garukaya" (Oil grass)	*Cymbopogon goeringii* Honda	Grows in northern areas of Shikoku toward Inland Sea.

[*Continued next page*]

TABLE VI—(Continued)
CHARACTERISTIC MEADOW SPECIES OF JAPAN

COMMON NAME	SCIENTIFIC NAME	REMARKS
	REGION: KYUSHU (Latitude 31°-34° N.; Longitude 129°-132° E.)	
Japanese mugwort "Otoko-yomogi"	*Artemisia asiatica* Nakai *Artemisia japonica* Thunb.	Characteristic of sandy beaches.
Angelica St. John's lily	*Angelica kiusiana* Max. *Crinum asiaticum* Linn. var. *japonicum* Baker *Peperomia japonica* Mak.	Subtropical plants found in protected places on beaches, chiefly on the islands of Ao and Biro.
Eupatorium Loosestrife Dahurian patrinia	*Eupatorium lindleyanum* DC. *Lysimachia clethroides* Duby *Patrinia scabiosaefolia* Fisch.	Vegetation, generally, of marshes, swamps and bogs.
Moso bamboo (Tall bamboo) Tall bamboo	*Phyllostachys edulis* A. et C. Riv. *Phyllostachys* spp.	Luxuriant growth favored by climate of Kyushu.
Dwarf bamboo ("Sasa")	*Arundinaria communis* Mak.	All dwarf bamboo of whatever genera is called "Sasa."
"Susuki" (Chinese silvergrass)	*Miscanthus sinensis* And.	Covers many small clearings between cultivated land and forests.
Bentgrass	*Agrostis matsumurae* Hack.	Frequently found along roadsides and in fields.
"Todo-shiba"	*Arundinella hirta* Tan. var. *ciliata* Koidz.	
Bermuda grass	*Cynodon dactylon* Pers.	
Cogon grass	*Imperata cylindrica* Beauv. var. *koenigii* D. et S.	
Japanese bush clover	*Lespedeza bicolor* Turcz. var. *japonica* Nakai	
Sericea lespedeza	*Lespedeza cuneata* G. Don	
Black medic	*Medicago lupulina* Linn.	
Kentucky blue grass	*Poa pratensis* Linn.	
Western bracken	*Pteridium aquilinum* Kuhn var. *japonica* Nakai	
Thunberg's kudzu bean	*Pueraria thunbergiana* Benth.	
Burnet	*Sanguisorbia carnea* Fisch.	
White clover (Dutch clover)	*Trifolium repens* Linn.	
Japanese lawn grass	*Zoysia japonica* Steud.	
Sedge	*Carex leucochlora* Bunge	Some vegetation appearing mainly in Northern Kyushu.
"O-garukaya" (Oil grass)	*Cymbopogon goeringii* Honda	
Horseweed fleabane	*Erigeron canadensis* Linn.	
"Niga-na" (a lettuce)	*Ixeris dentata* Nakai	
Japanese goldenrod	*Solidago japonica* Kit.	
Greenbrier	*Smilax nipponica* Miq.	Appearing chiefly in Southern Kyushu.
Fringed galax	*Schizocodon soldanelloides* S. et Z.	Grow in higher mountain areas.
Cowberry (Mountain cranberry)	*Vaccinium vitis-idaea* Linn. var. *minus* Lodd.	
	Rhododendron kiusianum Mak.	Covers highest peaks with dense mass, flowering in spring.

Source: Based on Data from Ministry of Agriculture and Forestry, Japan, and from Natural Resources Section, GHQ, SCAP.

FARM CROPS AND FARM PRACTICES OF JAPAN

The predominantly mountainous terrain of the greater part of Japan severely limits Japan's agricultural production and confines the cultivable portion to approximately 16,000,000 acres of land, which is about one-sixth of the total land area of the country. Farmers of Japan are highly industrious and among the world's greatest masters in the art of most assiduous cultivation of land. Despite that and though about one-third of the intensively cultivated land is double- or multiple-cropped, permitting the harvesting of nearly 20,000,000 acres of food annually on the 16,000,000 acres of cultivated land, the total acreage of their closely crowded miniature fields appears to be too limited to insure sufficient food for a total population of more than 84,000,000 persons and to provide a decent livelihood for a farm population of 38,000,000. There is less than one-fifth of an acre of cultivated land per inhabitant of Japan and less than one-half of an acre per member of a farmer's family. In other words, the population density of Japan is about 565 persons per square mile of the total land area and approximately 3,390 persons per square mile of cultivated land area.

The pressure of a large farm population on the limited cultivable area of Japan has resulted in very small farm units throughout the greater part of the country, and in a rural landscape which reflects utmost thrift, extreme frugality, and man's age-long struggle with the earth in his effort to coax it to give its most to a people too numerous for its limited farmlands.

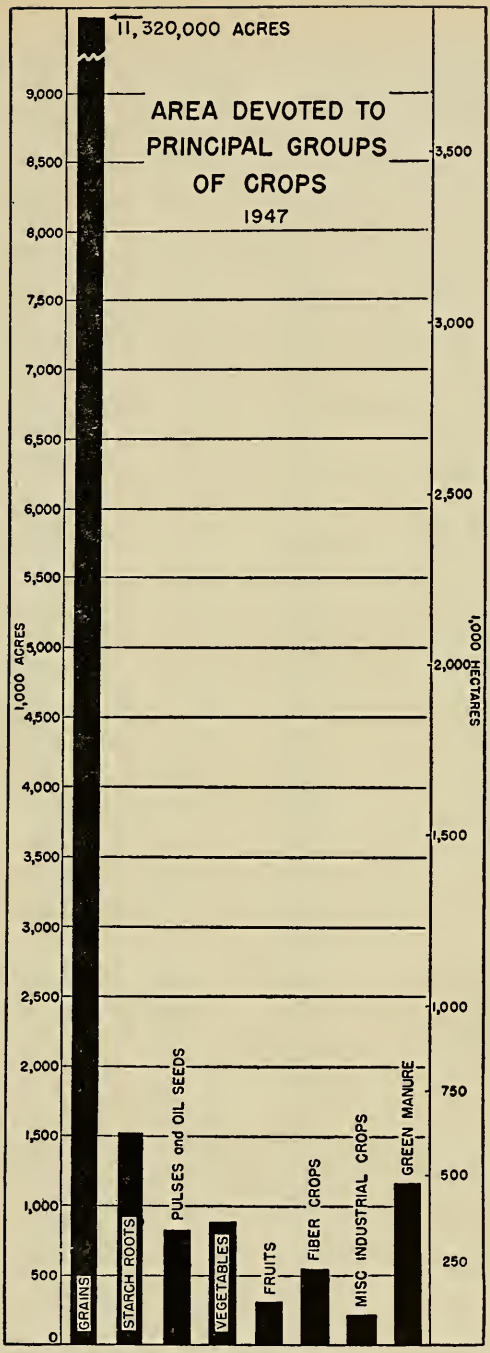
There are over 6,000,000 farm households in Japan with the tilled area per family averaging for the country as a whole about 2.5 acres; in Hokkaido the average farm unit has four times as much land, while in the most densely populated farming regions of southern Japan the tilled land area per family is frequently less than 1.5 acres. Much of the farm land of an individual household consists of a considerable number of widely scattered tiny parcels of land or fields—a result of generations of subdivision of a single family's holdings or of the traditional practice prevailing in some localities of having periodic equal division of village lands among the villagers on a qualitative as well as quantitative basis. The average farm of Japan of less than 2.5 acres of land consists of 10 to 20 scattered plots of land of about a fifth to a tenth of an acre in size and including both irrigated (paddy) and nonirrigated (upland) fields. Though the smallness of individual fields often hampers a rational development of irrigation and drainage facilities and constitutes a barrier to the wider use of animal and mechanical power (should such be deemed advantageous to the future rural economy of Japan) the scattering of fields is to a considerable extent inevitable on farms having irrigated and nonirrigated fields. The scattering of tiny fields serves also as some insurance against

a complete destruction of an individual family's crops by a flood or other disaster which frequently affects only one section of the land area of a given village. In the absence of such a safety factor even a relatively minor crop failure might lead to great hardship and pose serious problems to an average Japanese farmer with his extremely meager margin of profit and savings, if any, and with the year-round arduous labor of his entire family usually providing no more than a bare subsistence.

The farmer's choice of crops, farm land use, and field practices in Japan are a result not only of the diverse climatic, topographic, and soil conditions of the various areas of the country but also of the economic needs and food customs and habits of the people. Japan's economic needs call for the growing of the heaviest yielding crops and demand unremitting and incessant labor and painstaking cultivation in order for the farmer to get the maximum yields from the land. Rice is the major grain crop; grain crops dominate food production; and high-calorie-producing food crops take precedence over all industrial crops. Thus, during 1947, according to the Ministry of Agriculture and Forestry of Japan, 67 per cent of the land planted to crops was in grain, and the grains and starch roots (sweet potatoes, white potatoes and dasheen) occupied 76 per cent of the crop land; all other food crops together covered only about 12 per cent of the cropped area. Industrial crops (more than one-half of which are mulberries used primarily as feed for silkworms) occupied only about 5 per cent of the cropland, and green manure crops, approximately 7 per cent of the total cultivated land. Land areas devoted to the principal groups of crops may be seen in Figure 10.

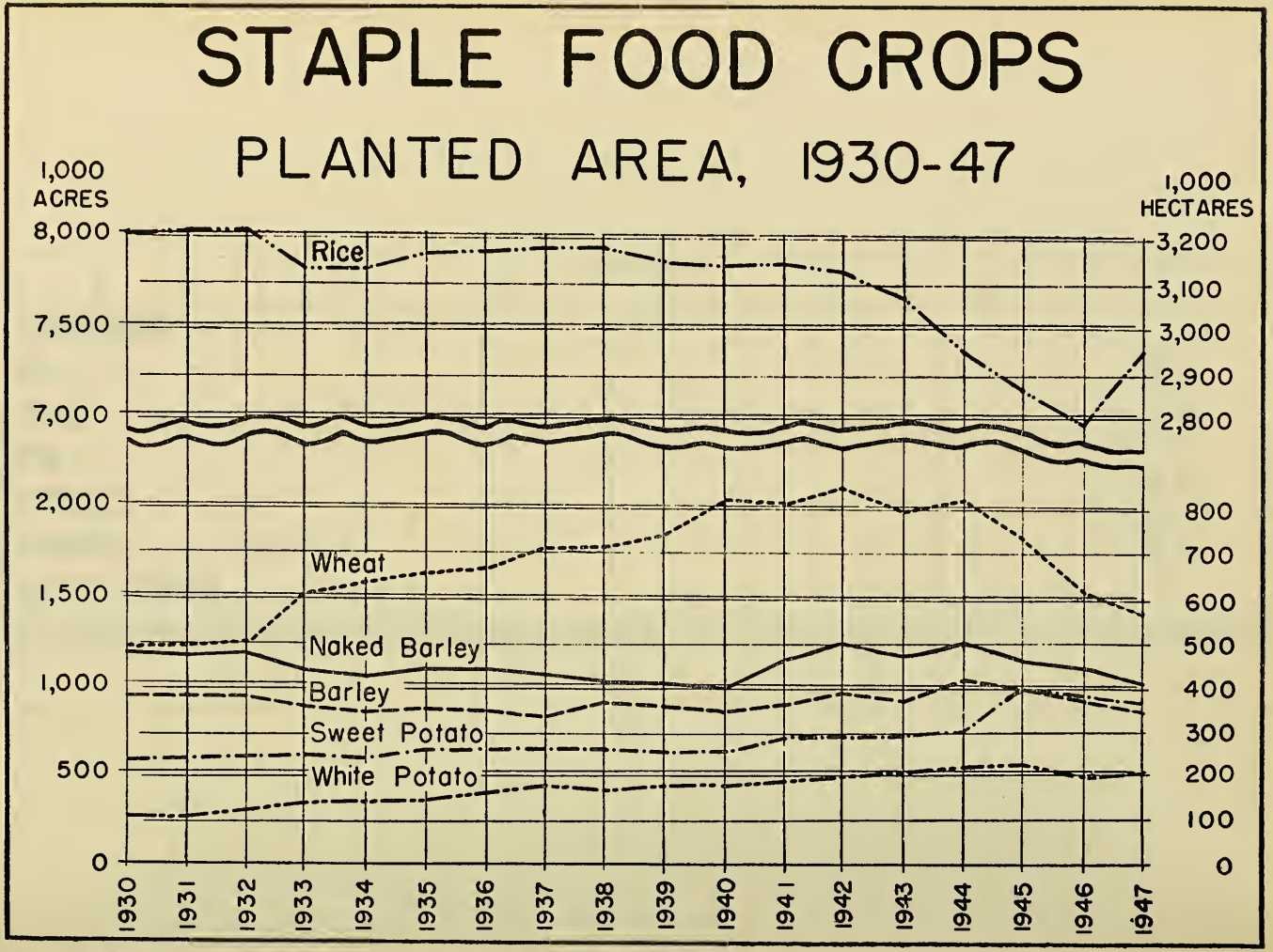
Nearly half of the total land area under food crops is devoted to the growing of rice (Figure 10A). In terms of its water requirements the rice of Japan is classified as paddy rice and as upland rice. The former is grown on irrigated fields while the latter is grown without irrigation, and distinct varieties of the two have been selected and are being used in Japan. About 98 per cent of all rice grown in Japan is paddy (irrigated) rice. Irrigated rice yields more per unit area of land than does any other grain crop (Table VII). It is the most important single crop and the basic and most preferred cereal food of Japan. It is held in great esteem by the Japanese and constitutes the leading food and the mainstay of their diet. The remainder of the cultivated area of Japan is devoted largely to nonirrigated food crops the most important of which are wheat, barley, naked barley,[1] nonirrigated rice (upland), sweet potatoes, and white potatoes. The total annual production of the staple food crops of Japan may be seen in Figure 10B. Relative importance of the major groups of crops throughout the country is shown in Table VIII, while relative importance of these crops in each of the 46 prefectures is indicated in Table IX.

[1] Naked barley threshes free of glumes as in common wheat.



Source: Natural Resources Section GHQ SCAP

Figure 10



Source: Natural Resources Section GHQ SCAP

Figure 10A



Source: Natural Resources Section GHQ SCAP Figure 10 B

For Japan as a whole the average yield of irrigated rice per unit area is the highest among all the major rice-producing countries of Asia. This is true despite the fact that much of the rice of Japan is grown farther north and at higher altitudes than it is in most of the other major rice producing countries. Moreover, were the average yields of irrigated rice of Japan to be computed on the basis of definite latitudinal-altitudinal settings and these compared to their counterpart areas in the outside world, then Japan's average yields of irrigated rice would be even more striking. They would also provide a rational basis for comparison with the very high average yields reported by Willahan for the relatively small acreage of irrigated rice in Spain, Italy, Chile, and Australia. As a whole there are probably few countries in the world in which crop yields per acre are as high as those of the staple crops of Japan (Table VII). The high yields probably reflect Japan's population pressure on the land just as much as they do the country's favorable climatic conditions for plant growth. They are to a very large degree the result of the need to make the limited area of cultivated land count as much as possible with the consequent use of numerous labor-consuming but land-saving devices. Heavy application of fertilizers, intensive hand cultivation and weeding, transplanting, intertilling, multiple-cropping, and irrigation (in the case of paddy rice) are among the common land-saving cultural practices of Japan. Despite lack of most facilities and aids to crop production that are essential for the American farming system, the Japanese obtain high yields of crops of good quality.

A comparison of the nation-wide average yields per acre of some of the staple crops of Japan with the nation-wide average yields of the same crops in the United States may be of interest:

Average Yields of Some Staple Crops
For Comparison

	Japan (1930-1947)[1]	United States (1930-1949)[2]
Irrigated rice	72.5 bushels per acre	47.3 bushels per acre
Wheat	29.27	15.2
Barley	42.29	22.5
White potatoes	155.4	138.0
Sweet potatoes	200.8	88.0

[1] A Report on Japanese Natural Resources, NRS, GHQ, SCAP, 1949.

[2] Crop Production Report, Crop Production Board, Bureau of Agricultural Economics, United States Department of Agriculture, November 1, 1951.

It must be recognized, however, that the comparison of average yields alone without taking into account the amount of labor spent, the quantity of fertilizers applied, and the prevailing agro-ecological conditions does not tell the whole story and is of very limited significance only. A comparison of yields and the economics of crop production between fairly similar agro-ecological areas of Japan and the United States could however, be most revealing, and useful.

The prevailing system of agricultural land use throughout Japan consists of an intricate field pattern of paddies or irrigated lands, and of upland fields or nonirrigated lands. Almost without exception from the extreme south to the north of Japan the irrigated lowlands or terraces are planted to rice during the warm season of the year. Irrigated rice is grown on alluvial lowlands or bench terraces wherever possible. The usually closely crowded, tiny fields of irrigated rice are fringed or interspersed with fields of nonirrigated crops scattered throughout the interstream areas and the hill borders of lowlands as well as on natural slopes and on partly or completely terraced slopes of the numerous mountains of the country. To keep the irrigated rice fields flooded, ridges or miniature dikes about a foot wide and a foot high separate the small individual fields, and the surplus water is usually led from the fields of the higher level to those below. Soybeans or other crops are planted as field borders on these dikes. Wherever climatic conditions and soil drainage permit, the summer-grown irrigated rice is followed by winter crops, usually small grains. The winter temperatures of nearly all Japan are too low to permit the production of a second rice crop. The only exceptions to this are the very limited area of southern Shikoku in the Kochi Plain, the small portion of the southernmost Kii Peninsula in southeastern Honshu, and Kagoshima Prefecture in southern Kyushu, where two crops of irrigated rice are grown during the year (Figure 3) as a monthly average temperature above 50° F. prevails approximately during eight months of the year—from late March through November.

Paddy Rice

The making of a rice paddy field from uncultivated land or from an upland field is usually a formidable task, as Alsberg points out. The water supply must be made certain first. Next comes temporary removal of topsoil, the arduous leveling of the land, building of embankments when necessary or retaining walls of various shapes and heights along the slope of the land so that there will be a flat surface for the paddies to permit of inundation. To be effective for growing a rice crop the paddy must retain irrigation water, and much effort is spent in tamping down the subsoil and making it watertight before topsoil is replaced. The ever-present possibility of encountering a spring or perhaps subsoil that is too light

and porous ever to be made satisfactorily watertight injects an uncertainty as to the final results of the hard labor involved in building a paddy.

Rice is planted in the irrigated fields of Japan either through use of nursery grown rice transplants or through the direct sowing of rice seed. With the exception of the cooler areas of Hokkaido where direct sowing of rice seed in the paddy fields is practiced, the planting of nursery-grown transplants is the predominant method utilized throughout most of the irrigated rice fields of Japan. This method requires more time and labor than does the direct sowing of rice seed in paddy fields. However, the control of weeds in directly sown rice is often more difficult than in transplanted rice and the consequent increased cost of weed control, it is claimed, offsets much of the saving made by direct seeding. The reasons for transplanting include, besides weed control an economical use of seed per unit of planted area, and saving of irrigation water because of shortening the required irrigation period. The practice of transplanting also provides a more flexible field management program which makes possible a better utilization of paddy land, as it enables the farmer to delay the field planting of rice without delaying too much the time of ripening. In the double-cropping areas of Japan this allows a somewhat greater interval of time (usually all too short) between harvest of winter grain and field planting of rice (Figure 14), permitting the fall-sown wheat or barley to mature before rice is planted in the paddy (Figure 16). Planting of two cereal crops on the same field per year is of course of very great economic importance to the Japanese farmer, with his meager land resources, and the two cereal crops per year would in some double-cropped regions of Japan be difficult with direct seeding of rice. The claim often made that transplanting is conducive to higher yields per acre does not appear to be borne out by actual experimental studies. The use of nursery-grown transplants makes possible also an earlier starting of seed in the cooler areas, as the nursery seedbeds can be fairly easily protected from cold through the use of warm and sheltered sites, through the use of hotbeds, and through the use of cold frames covered with some insulating material such as strips of oil paper, which are used widely in the northern regions of Japan. The seedlings are thus made available for early transplanting in the spring as soon as soil temperature of the paddy field permits.

The rice nursery is usually handled very carefully in order to produce healthy, firm, and uniform seedlings. Seedbeds as a rule are worked up to the consistency of a fine, soft mud, largely by hand labor, and are fertilized with organic and commercial fertilizers. The common practice in Japan is to select the seed carefully, soak it in water, treat it with fungicides to control seed-borne diseases, and broadcast it by hand on the properly prepared seedbed from which the water has been drained. Immediately upon germination of the seed the most common practice calls for irrigation and for continued irrigation of the seedbeds throughout the growth of

the rice seedlings. Semi-irrigated nursery beds (which are irrigated only during the early stages of growth of seedlings) and dry nursery beds (where rice seedlings are grown without benefit of any irrigation) also are used occasionally in some areas of Japan. In the irrigated rice nurseries, uniform soil temperatures often are maintained through the use of water. This is accomplished by flooding the nursery beds in the late afternoon to maintain a more favorable night soil temperature and by draining the water in the morning in order to raise the temperature of the soil. In the irrigated nurseries the water is gradually raised as the seedlings grow and when the seedlings have developed 4 to 7 leaves, generally 30 to 50 days after seeding in the nursery, they are large enough to be pulled out and transplanted to the paddy fields. Actually, in the northern regions of the country the seedlings at the time of transplanting have 4 to 5 leaves and are about 30 days old, while in the central and southern regions the transplants usually have 6 or 7 leaves and are up to 50 days old.

Paddy fields are normally being prepared for transplants throughout the time rice seedlings grow in the nursery. Preparation of the paddy field is more or less the same as that of the seedbed, though usually somewhat less thorough. It involves the application of organic manures, commercial phosphates, and potash, and part of the nitrogenous fertilizers prior to the plowing of the land. The fields are then hand-spaded or plowed about four inches deep, then flooded so as barely to cover or submerge the surface of the soil, and finally the wet soil is harrowed thoroughly several times and puddled. Thereafter the field is covered with two to four inches of water and is ready for the nursery-grown transplants. Clumps of three to seven seedlings are planted in each hill. These are pushed easily by hand into the thin mud by women and men standing in water and planting the seedlings from sunrise late into the night for many days. Various markers such as strings or rulers are used to maintain uniform space between hills and between rows. The spacing, which is usually designed to permit hand cultivation, hand weeding, and use of hand sickles for harvesting, ranges from 8 to 12 inches between rows and from about 4 to 8 inches between hills. In general, the spacing varies with the variety, soil fertility, and climatic conditions of a given area. Closer planting of seedlings is required when low-tillering varieties are used or where tillering is hindered and low as a result of unfavorable climatic soil conditions or field practices, such as holding water at considerable depth and for long periods of time after transplanting in order to control certain noxious weeds. The common practice is to increase the depth of water for about 10 to 14 days as soon as the transplanting is completed in order to hold the seedlings in an upright position. At the end of this period the seedlings are usually well established, the depth of water is then lowered and the fields are weeded and cultivated. The paddy

field remains flooded most of the time with 4 to 8 inches of water until it is ready for the final draining before harvest. Throughout this time, however, the paddy is partially drained at certain intervals to permit cultivation and weeding and is drained also prior to top-dressing with nitrogenous fertilizers. The paddy is then flooded again a few days later.

Fields are usually top-dressed one to three times, worked up with hand cultivators three times, and hand weeded once or twice prior to the jointing stage of rice. Soon after the rice is fully headed the fields are usually drained, wherever soil drainage conditions permit. Rice grain usually matures three to five months after seedlings are transplanted, depending on variety and locality. Harvesting is done with hand sickles; straw is cut close to the surface of the ground in order to save as much of it as possible for use in making mats, bags, baskets, hats, paper, etc. The cut plants are tied into bundles and dried in the field, on levees, or on ditch banks, and frequently, where drying is difficult because of wet land or poor weather, the bundles are hung to dry for about three weeks over various drying racks, poles, or trees adjacent to or surrounding the paddy fields. Threshing is most commonly done either with the usually individually owned, foot-pedal threshers or with community-owned small threshers operated by electric power or by 3- to 5-horsepower gasoline engines. Cleaning of the threshed rough rice through fanning, winnowing, and screening, and dehulling it in power-operated hullers complete the process and yield the brown rice[2] which is commonly milled in Japan for use as food.

The above outline and description of Japanese paddy rice culture reflects in the main the general pattern and major characteristics of cultural methods and field practices employed in the growing of irrigated rice there. These methods and practices, however, vary considerably and are modified in some regions and localities of the country. Thus, the nursery stage is completely eliminated and the initial field practices are considerably modified with direct sowing of the paddy fields. This method, as already mentioned, is practiced in the cooler areas of Hokkaido to some extent. It is also practiced in a number of other areas of Japan wherever it offers certain advantages because of shortages of labor or of water or of healthy seedlings during transplanting time or wherever soil conditions are unfavorable for transplanting. In the direct sowing method there are two distinct practices. One is to sow the seed in wet, shallow furrows made after the land has been thoroughly prepared, fertilized, flooded, and drained. The other method is to sow the rice in dry, shallow furrows, made after the land has been well prepared and fertilized; with the sowing completed, the land is irrigated. Actually, either of two systems is employed in the dry seeding: (1) sowing on plowed land and (2) sowing between rows of winter crops which are already planted (wheat, barley, etc.).

[2] Rough rice (45 pounds per bushel) will yield from 70 to 80 per cent of brown rice (66 pounds per bushel) by weight, or 50 to 60 per cent by volume.

When seeding is made between rows of winter grain, irrigation water is usually applied after the harvest of the winter crop, whereas when seeding is made in plowed land there are a number of practices in reference to application of fertilizer and period of irrigation, the most common one being that of applying fertilizer, sowing and irrigating. Direct sowing of the paddy field by broadcasting is the most common method, but drill seeding and sowing in hills and checks are practiced also.

Leonard, pointing out that Japan's cultural methods for paddy rice frequently vary from district to district because of temperature conditions and traditional local practices, has classified the general cultural practices employed in the growing of paddy rice in Japan somewhat as follows, which outline is modified here to include additional information:

Temperature Zone	Geographical Region	Cultural Practices
Cold	Hokkaido	Approximately 20 per cent direct sowing; 80 per cent transplanting, largely with seedlings from protected nurseries.[1]
Cool	Northern Honshu (Tohoku)	Early transplanting—early sowing and early transplanting of early varieties.
Medium	Middle of Honshu	Ordinary transplanting methods—except for Hokuriku district where early sowing and early transplanting are practiced because of frequent autumn rains which make difficult the drying of late-harvested crops.
Warm	Southern parts of Honshu, and Islands of Shikoku and Kyushu	Late transplanting—with somewhat late sowing and late varieties.

[1] Until 10 years ago, 80 per cent of paddy rice in Hokkaido was directly sown, whereas at present only 20 per cent is. The change has been made possible as a result of extensive use of protected nurseries (cold frames covered with oil paper), which supply 60 per cent of all transplants, the remainder being supplied by ordinary nurseries, according to the National Agricultural Experiment Station of Hokkaido.

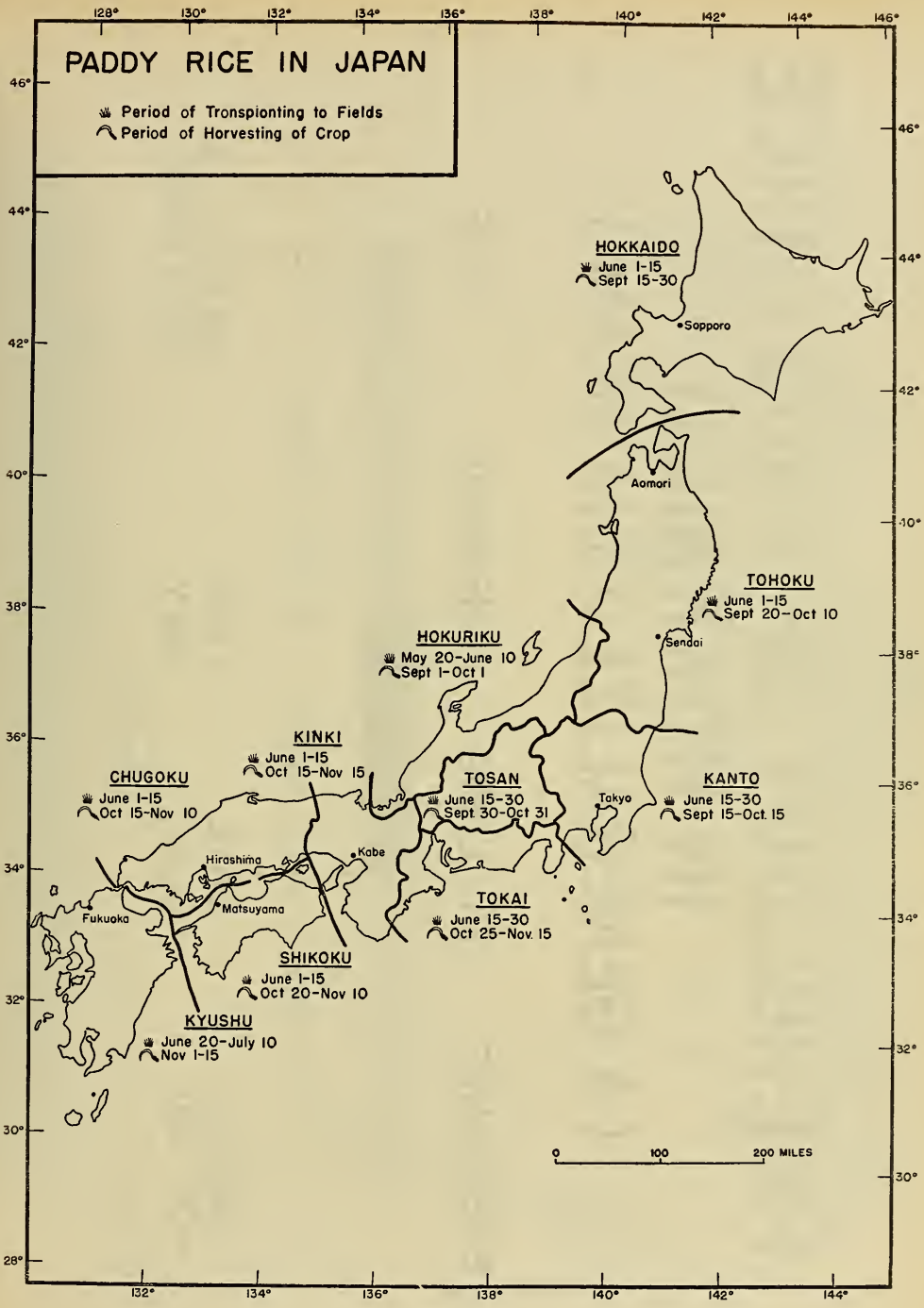
As production of irrigated rice is carried out in Japan under highly diverse environmental conditions and under highly different crop rotation and crop sequence practices, a great number of paddy rice varieties differing greatly as to their growth requirements and adaptation are in use. The extremely diverse micro-climatic conditions prevailing in each of the various regions of Japan appear in themselves to be very great obstacles to the practice of planting fewer and more widely distributed standardized varieties, for it appears to be very difficult to combine in a single variety the many genetic characteristics necessary to make it suitable for use throughout any one of the major agricultural regions of the country. The issue is still further complicated by the prevalence of different diseases and pests (Tables XVI and XVII) as well as by the specific economic problems and needs of various areas. Rice varieties are classi-

fied as of early, mid-season, and late maturity. Most of the paddy rice varieties grown in Japan are of nonglutinous type though a small amount of glutinous rice is also grown. Practically all rice of Japan is short-grained. The time of sowing nursery seedbeds of rice is determined by the required date of transplanting to paddy, which depends on the locality and varieties used. Dates of planting, ripening, and harvesting of different paddy rice varieties vary greatly throughout the country (Figures 11, and 11B, Tables X and XI).

Waldee and Roberts have stressed that blast of rice is by far the most serious biological menace to food production in Japan and is widely distributed, causing serious losses there every year. Leaf blast occurs commonly in southern Japan and epidemics of leaf blast usually occur after prolonged periods of cold and rainy weather in June and July. To minimize this damage the nursery seed beds must be planted at the proper time and young plants must be protected from cold irrigation water. Neck rot and node blast are most common in Hokuriku, Tohoku, and Hokkaido districts and are usually brought about during September by high humidity. To alleviate this situation irrigation should be stopped early in the maturing stage of the plant.

Leonard states that a large number of new rice varieties adapted to a particular region or for special conditions have been produced in Japan in recent years; that rice cultivation is hazardous in Japan's intermountain zones, as well as in foothills of these districts, because of low air temperatures and cold irrigation water; that cold irrigation water in the mountainous areas is conducive to severe outbreaks of rice blast disease (Table XVI); that rice crop failures in the cool northern districts of Hokkaido and northern Honshu are generally caused by low temperatures, especially when they occur in July and August which is the critical period in the growth of rice crops; that seedling rot disease of rice occurs under unfavorable low temperature conditions and that the problem of crop failures from low temperatures is being met by the selecting of cold-resistant varieties, growing of sound seedlings, early sowing in nursery beds, early transplanting, warming of irrigation water, and improving of fertilizer practices.

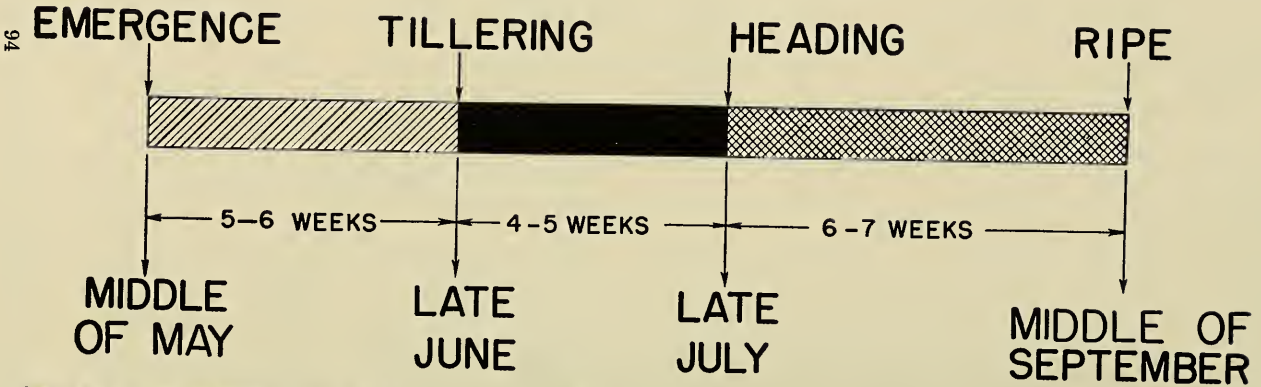
However, continuous warm weather has drawbacks, and Leonard says one of the most difficult problems in rice production in the warm districts of southwestern Japan is the serious outbreak of insects favored by high temperatures throughout the year. The paddy borer or three-brooded rice borer (Table XVII) found in these districts is limited to areas where the minimum temperature remains above 25.7° F., and much damage from this borer is avoided by delayed sowing and transplanting and use of late varieties of rice, the objective being to grow rice plants after moths of the first brood die. Late-sowing methods, as practiced in the Kumamoto



Source: Natural Resources Section GHQ SCAP

Figure 11

PHENOLOGY OF PADDY RICE IN HOKKAIDO
(A GENERALIZED DIAGRAM)

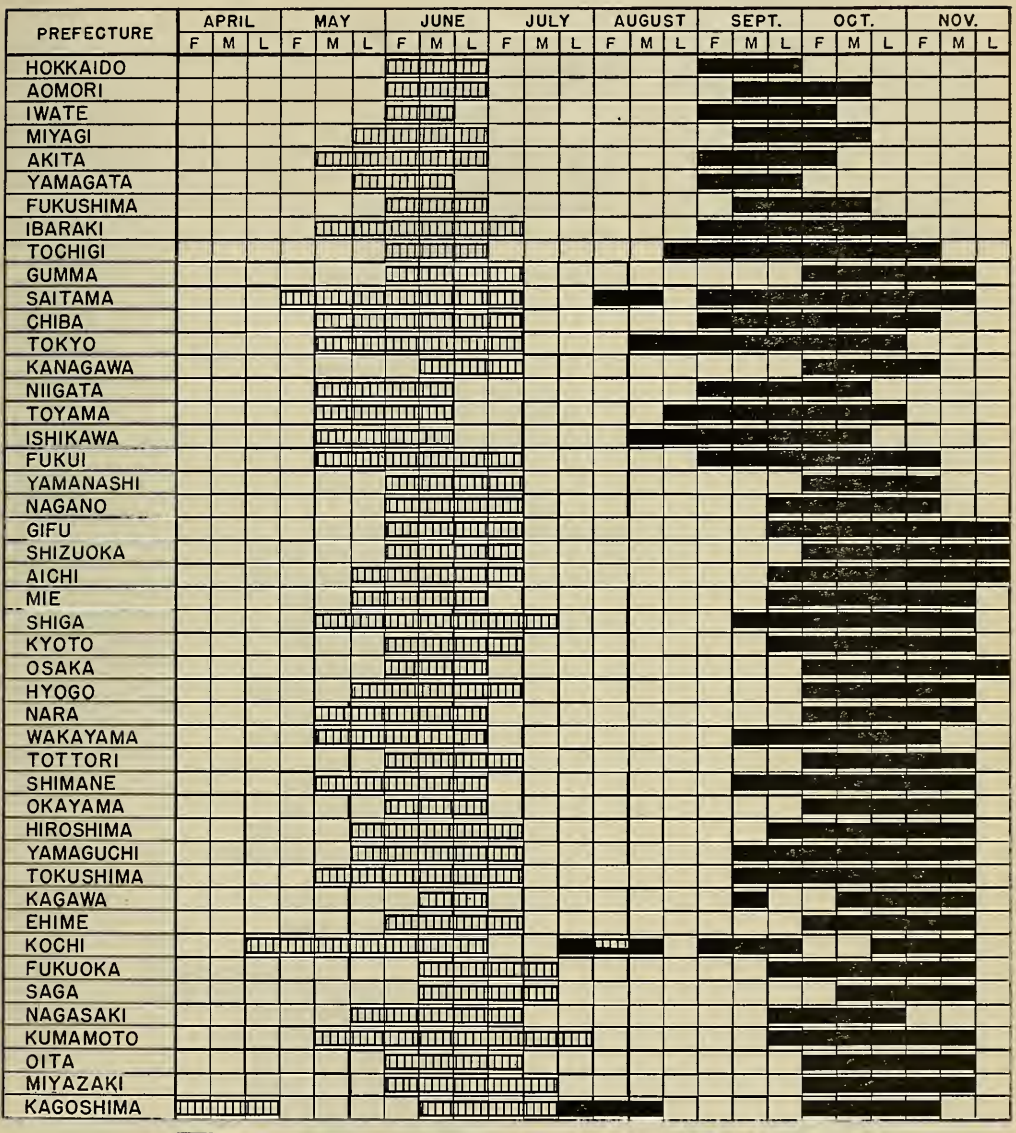


Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 11A

RICE
TRANSPLANTING AND HARVESTING PERIOD
IN EACH PREFECTURE OF JAPAN

F---FIRST 10 DAYS M---MIDDLE 10 DAYS L---LAST 10 DAYS



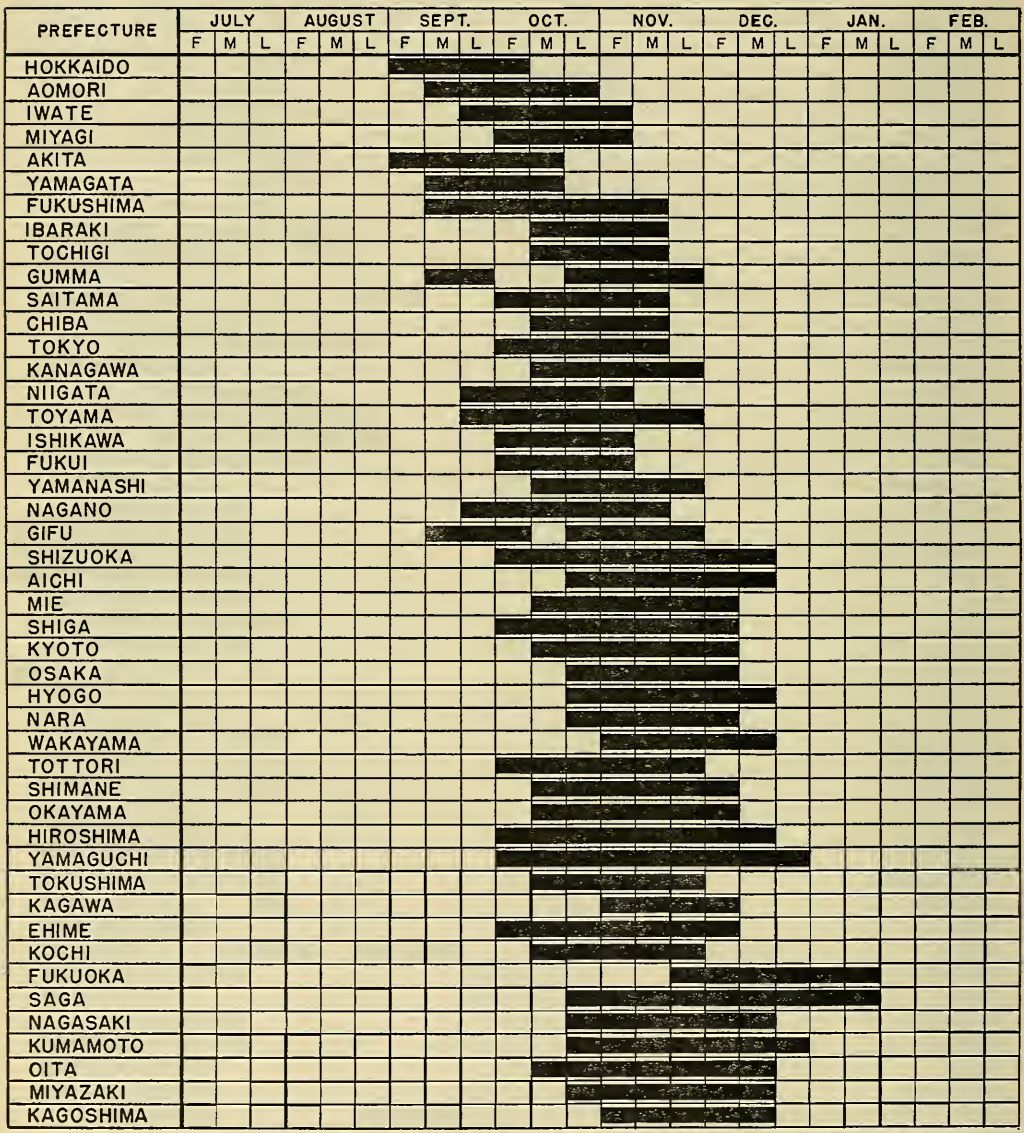
Source: Based on Data from Ministry of Agriculture and Forestry, Japan and Natural Resources Section GHQ SCAP

Figure 11B

WHEAT, BARLEY AND RYE

FALL SEEDING PERIOD IN EACH PREFECTURE OF JAPAN

F---FIRST 10 DAYS M---MIDDLE 10 DAYS L---LAST 10 DAYS



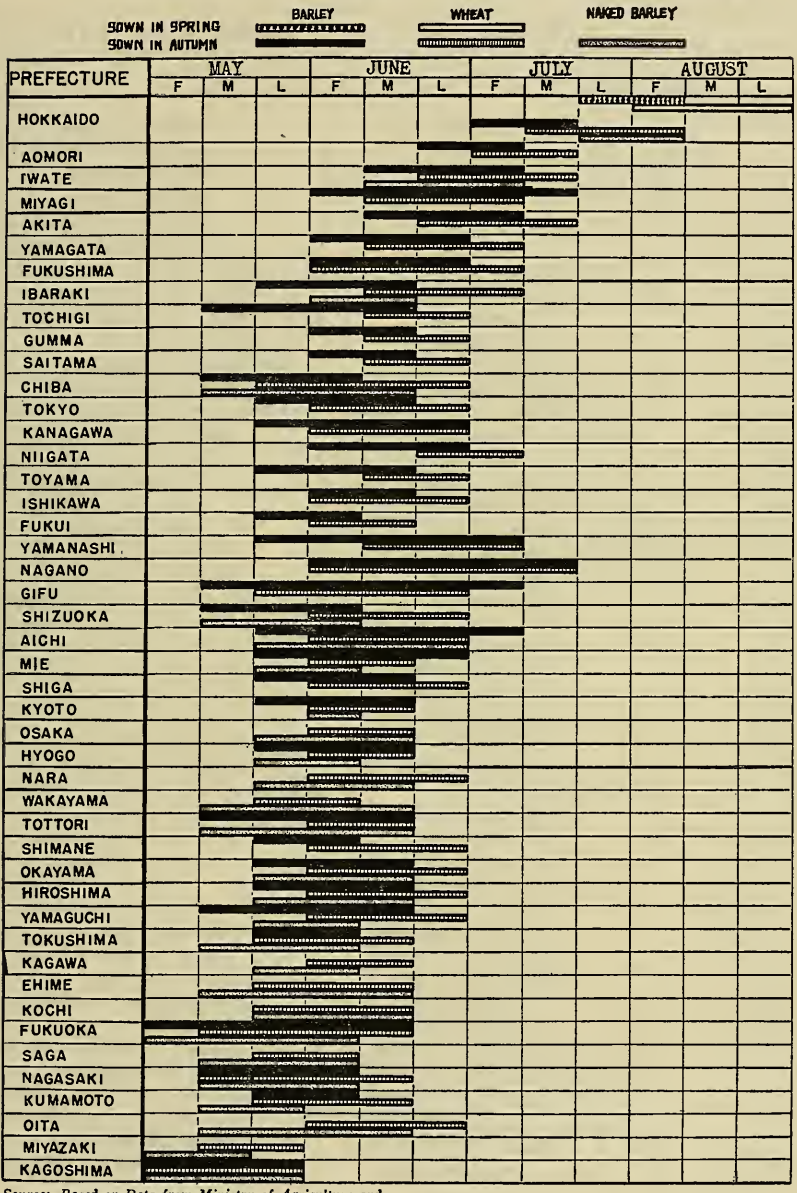
NOTE: SEEDING TIME OF BARLEY IS USUALLY SLIGHTLY EARLIER THAN THAT OF WHEAT WHILE THE SEEDING TIME OF RYE IS SLIGHTLY LATER THAN THAT OF WHEAT.

Source: Based on Data from Ministry of Agriculture and Forestry, Japan and Natural Resources Section GHQ SCAP

Figure 11C

BARLEY, WHEAT AND NAKED BARLEY HARVESTING PERIOD IN EACH PREFECTURE OF JAPAN

F---FIRST 10 DAYS M---MIDDLE 10 DAYS L---LAST 10 DAYS

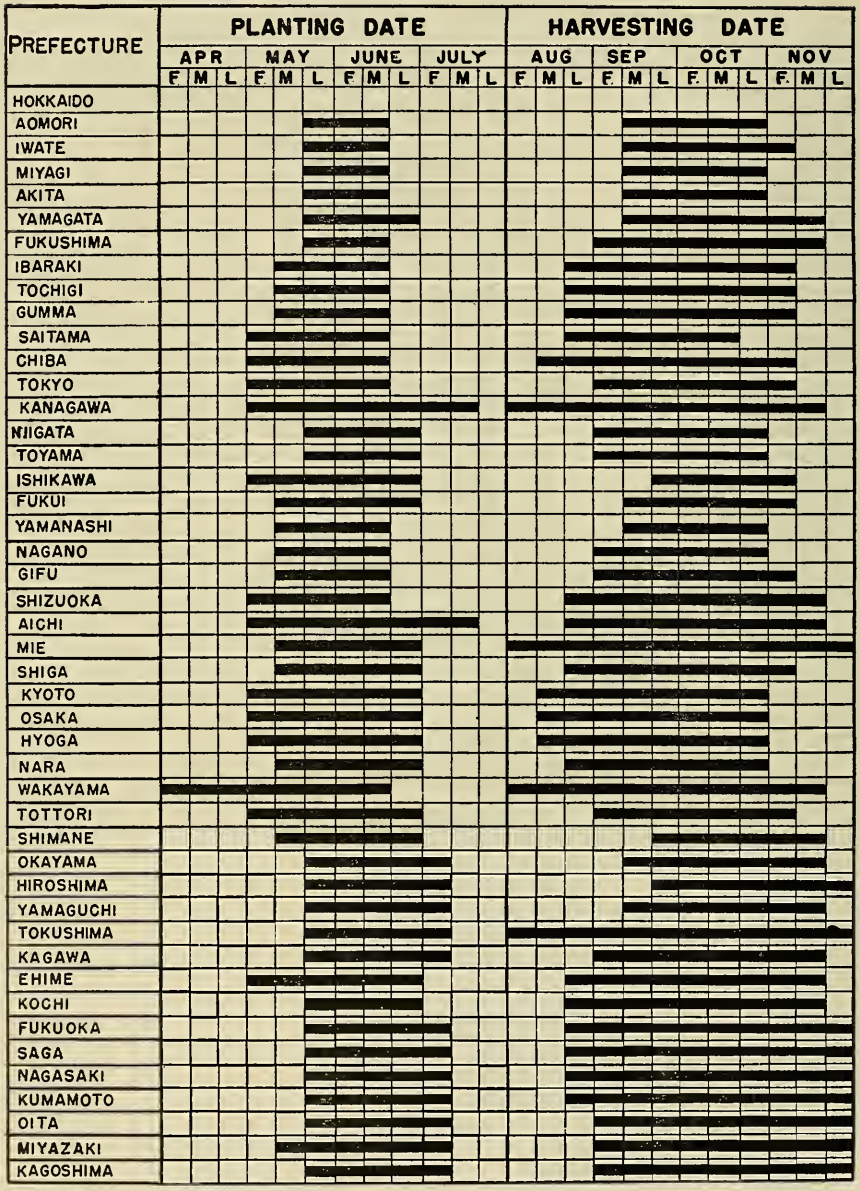


Source: Based on Data from Ministry of Agriculture and Forestry, Japan, and Natural Resources Section GHQ SCAP

Figure 11D

SWEET POTATOES
PLANTING AND HARVESTING PERIOD
IN EACH PREFECTURE OF JAPAN

F---FIRST 10 DAYS M---MIDDLE 10 DAYS L---LAST 10 DAYS

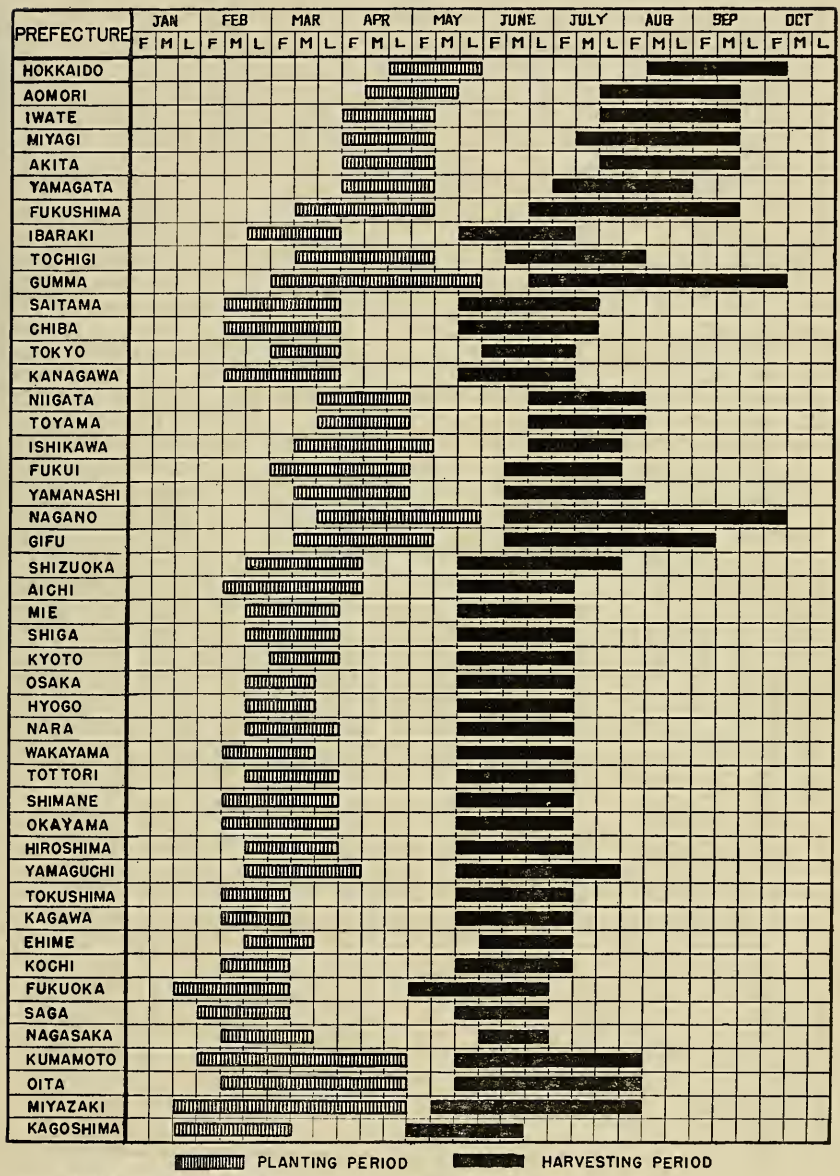


Source: Based on Data from Ministry af Agriculture and Forestry, Japan and Natural Resources Section GHQ SCAP

Figure 11 E

WHITE POTATOES
PLANTING AND HARVESTING PERIOD
IN EACH PREFECTURE OF JAPAN

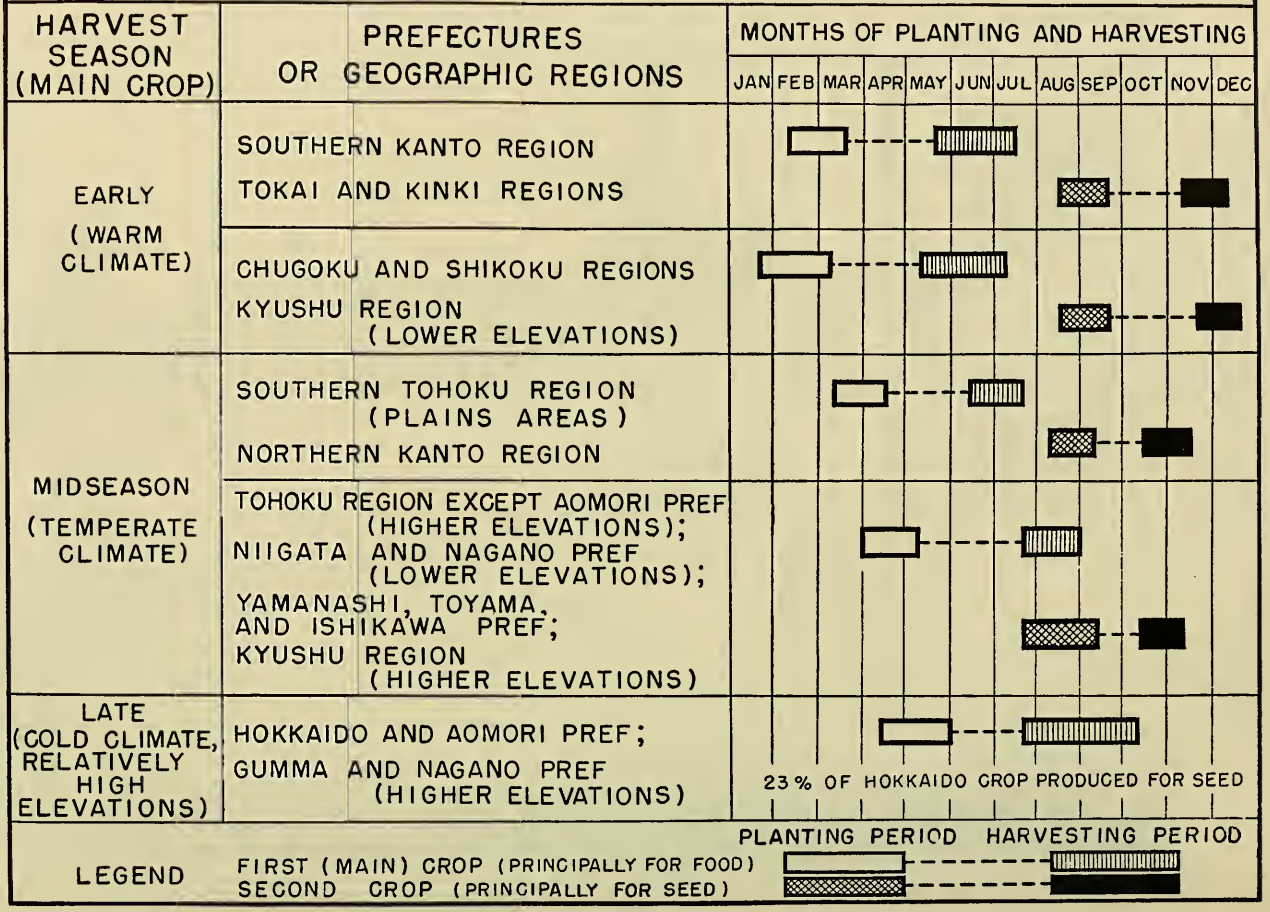
F---FIRST 10 DAYS M---MIDDLE 10 DAYS L---LAST 10 DAYS



Source: Based on Data from Ministry of Agriculture and Forestry, Japan and Natural Resources Section GHQ SCAP

Figure 11F

PLANTING AND HARVESTING PERIODS IN SEED POTATO PRODUCING AREAS


HARVEST SEASON (MAIN CROP)
PREFECTURES OR GEOGRAPHIC REGIONS
MONTHS OF PLANTING AND HARVESTING
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
EARLY (WARM CLIMATE)
SOUTHERN KANTO REGION
TOKAI AND KINKI REGIONS
CHUGOKU AND SHIKOKU REGIONS
KYUSHU REGION (LOWER ELEVATIONS)
MIDSEASON (TEMPERATE CLIMATE)
SOUTHERN TOHOKU REGION (PLAINS AREAS)
NORTHERN KANTO REGION
TOHOKU REGION EXCEPT AOMORI PREF (HIGHER ELEVATIONS);
NIIGATA AND NAGANO PREF (LOWER ELEVATIONS);
YAMANASHI, TOYAMA, AND ISHIKAWA PREF;
KYUSHU REGION (HIGHER ELEVATIONS)
LATE (COLD CLIMATE, RELATIVELY HIGH ELEVATIONS)
HOKKAIDO AND AOMORI PREF;
GUMMA AND NAGANO PREF (HIGHER ELEVATIONS)
23% OF HOKKAIDO CROP PRODUCED FOR SEED
LEGEND
FIRST (MAIN) CROP (PRINCIPALLY FOR FOOD)
SECOND CROP (PRINCIPALLY FOR SEED)
PLANTING PERIOD
HARVESTING PERIOD

Source: Natural Resources Section GHQ SCAP

Figure 11G

Prefecture in Kyushu, are described to illustrate the method. Seeds are sown in the nursery beds early in June; transplanting is performed about mid-July; the time of ripening varies from October 20 to November 10, or about the same as for normal culture. Since the transplanting is delayed beyond the favorable season for tillering, the stands of rice are increased to compensate for fewer tillers. The system of delayed sowing has been adopted also in some areas of Japan not only to control the three-brooded rice borer but also to make possible the cultivation of some other crops on the same land prior to setting out rice transplants. A detailed chart showing the various crop rotations of different prefectures of Japan is given in Figure 16.

Salmon, in reviewing the history of the improvement of rice varieties in Japan, points out that because rice is the most important crop there it has been the subject of more intensive and extensive investigations than any other crop; that the improvement of varieties by breeding and the experiments in the efficient use of fertilizers, especially the interrelations of fertilizers and varieties, have been among the most productive accomplishments of Japan's agriculture; that in addition to the impressive accomplishments of the plant breeders of Japan in the field of varietal selection and improvement of rice varieties, the many hundreds of years of rice cultivation of Japan have contributed considerably to the improvement of rice varieties as a result of natural selection as well as from conscious or unconscious selection by farmers. Leonard states that the paddy rice varieties developed by modern plant breeding methods have spread widely over the rice crop area of Japan since 1932, as shown by the popularity of the various relatively new "Norin" varieties developed by Japan's agricultural experiment stations. However, strains and hybrids of some of the old improved varieties (examples: Asahi, Aikoku), selected by farmers during the late 19th century and the first decade of the 20th century are also widely used and they occupy an important place among the more popular paddy rice varieties in Japan. The yields of some of the better rice varieties throughout the various prefectures may be seen in Table VII.

It seems generally reported that the better rice varieties planted in recent years produce higher yields only when heavily fertilized, and also that the full value of the fertilizers are realized only when improved varieties are used. Blast-resistant varieties distributed in Japan since 1930 have tended to replace older types. Some new varieties tested for hardiness in resisting low summer temperatures in the north have proved useful for early seeding in other sections where an early harvest is desired in order to avoid flood damage. The earliest upland rice variety yet produced (Norin No. 11) is reported to have characteristics making it rather satisfactory on paddy land even in the most northern parts of Hokkaido.

Common paddy rice varieties grown in Japan, according to Leonard,

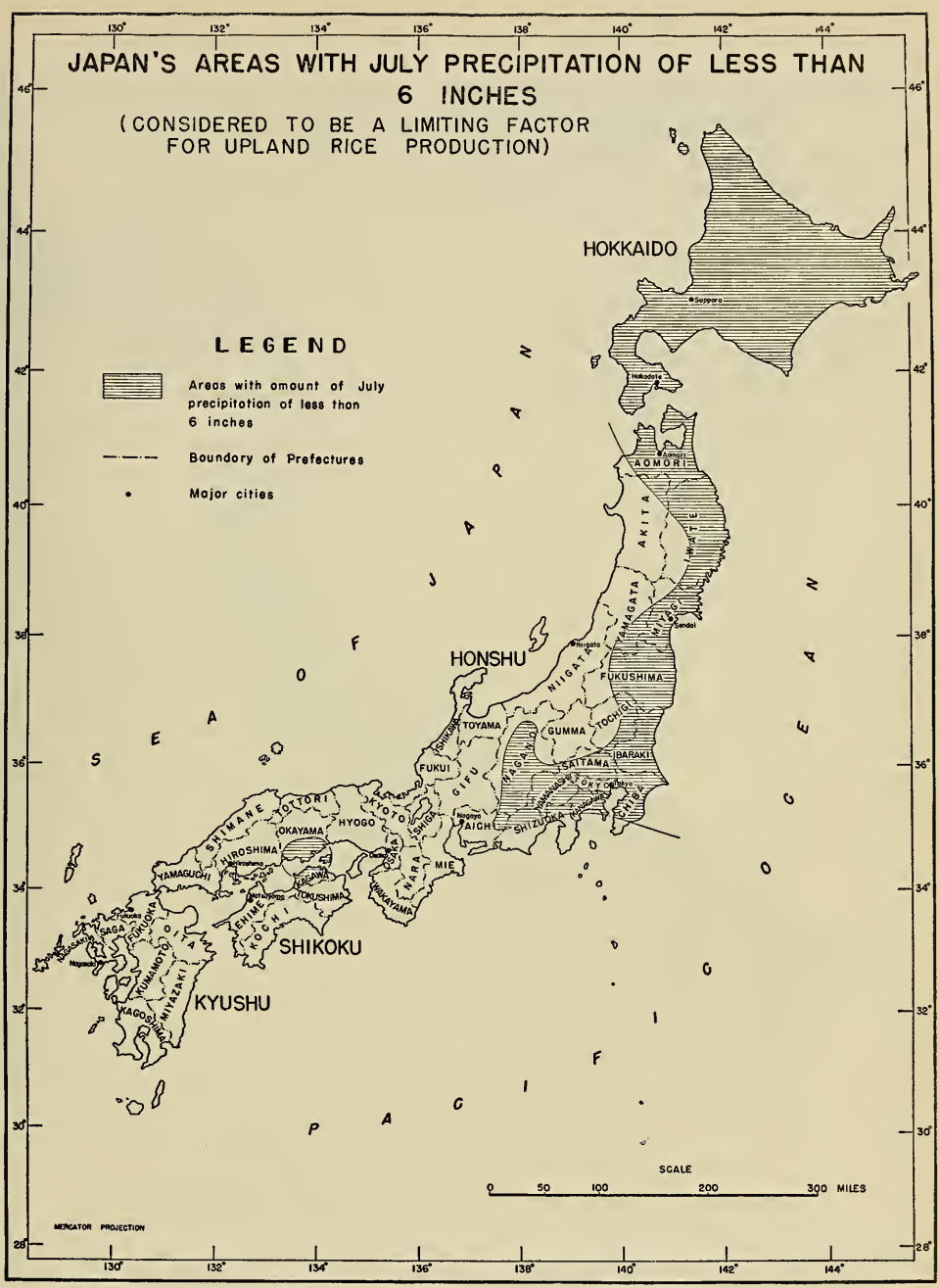
include Norin varieties No. 1, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 17, 18 and 20, Asahi, Riku-u No. 132, Aikoku, Gimbozu, Fukubozu, Aichi-Asahi, Sembon-Asahi, Takara, and Mii. The varieties designated Norin (*No* — agriculture; *rin* — forestry) are those developed by experiment stations of the Ministry of Agriculture and Forestry of Japan, as mentioned above.

Selection of early rice varieties for northern Honshu and Hokkaido, the temperature conditions of which are not unlike those prevailing in certain areas of New England and the Maritime Provinces of Canada, seems to be of special interest and importance, as the early maturity of these varieties makes it possible to grow rice almost throughout all irrigated land areas of northern Japan. A diagram showing characteristic growth stages and phenology of paddy rice in Hokkaido is given in Figure 11A. Early rice resistant to cold is also used in the higher elevations of the central and southern regions as well as in the warmer districts of southeastern Honshu, southern Shikoku, and southern Kyushu, where two rice crops per year are grown on the same land (Figure 3). The double rice cropping operation as practiced in Kochi Prefecture in Shikoku consists of using an early variety for the first crop and a late variety for the second. The nursery bed for the first crop is sown in late March or early April, transplanting takes place in early May, harvesting, in late July; the second crop is sown in nursery beds in late June, transplanting takes place in early August, and harvesting, in mid-November.

The tremendous emphasis on irrigated rice as the most important food crop has given it priority over other crops because of its yielding more calories per unit of land than any other cereal. The willingness and the ability of the Japanese farmer to spare no labor in growing the crop, the meticulous care and arduous work devoted to cultivating the rice paddy fields, and the extraordinarily high yields obtained per unit area of land, all, are conducive to a rather distinct land-use pattern in which irrigation water is the lifeblood of the agriculture even though this country is abundantly supplied with natural precipitation. Wherever water can be made available for irrigation and the land can be made level to permit inundation, irrespective of the cost of labor involved, the farm land is in paddy rice. Where water cannot be brought onto the fields in sufficient quantity for rice irrigation or where water is available but the terrain is too steep even for the Japanese farmer to carve it into terraced rice paddies, there nonirrigated crops are grown.

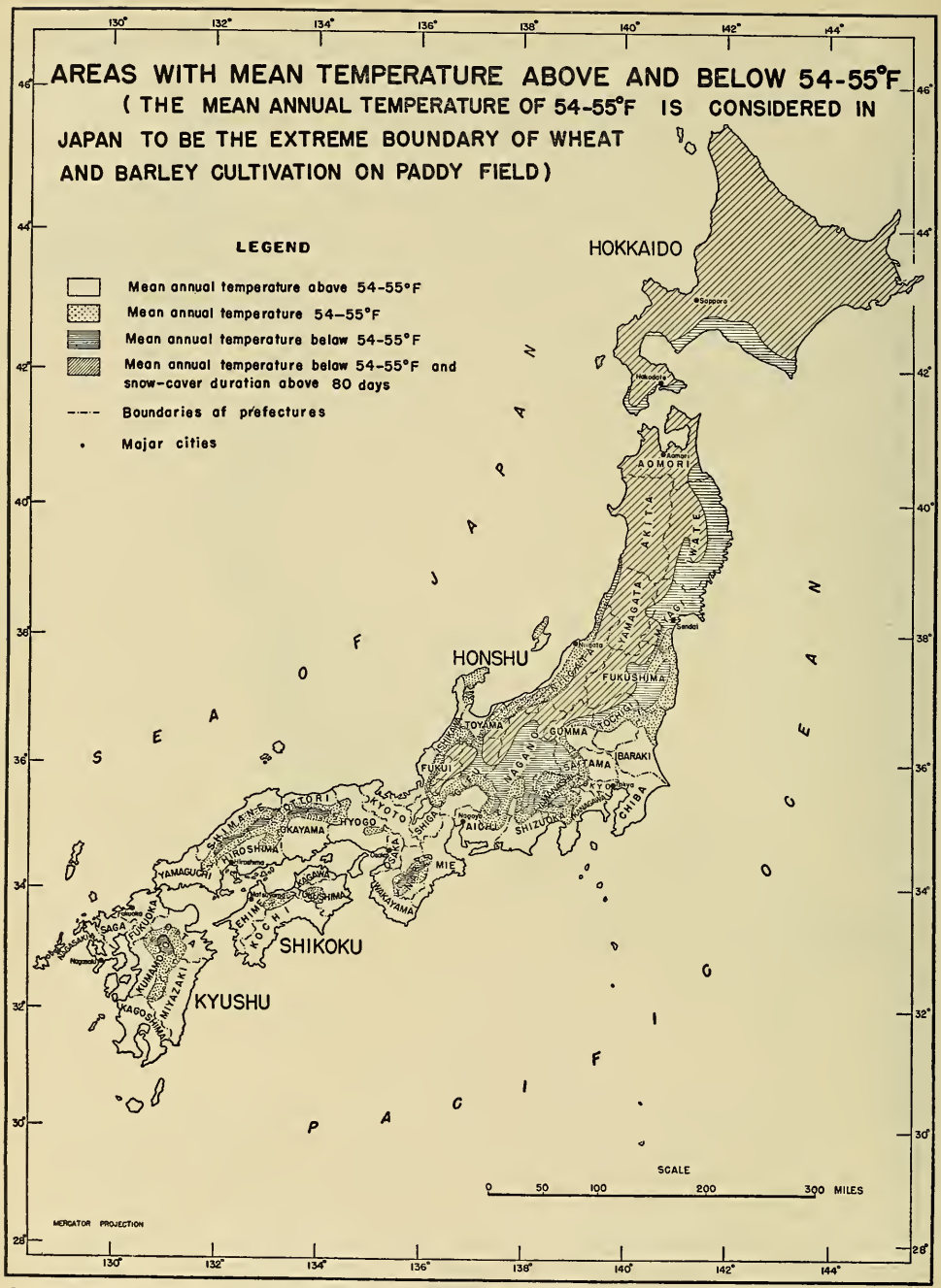
Double-Cropping of Paddies

Wherever climatic and soil conditions are favorable second crops are planted in paddy fields after rice has been harvested. A considerable part of the wet paddy land of Japan is thus double-cropped, that is, replanted to winter crops. Except for the very limited areas of Kochi Prefecture in southern Shikoku, the Kii Peninsula of southeastern Honshu, and Kago-



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 12


AREAS WITH MEAN TEMPERATURE ABOVE AND BELOW 54-55°F
(THE MEAN ANNUAL TEMPERATURE OF 54-55°F IS CONSIDERED IN JAPAN TO BE THE EXTREME BOUNDARY OF WHEAT AND BARLEY CULTIVATION ON PADDY FIELD)
LEGEND
Mean annual temperature above 54-55°F
Mean annual temperature 54–55°F
Mean annual temperature below 54-55°F
Mean annual temperature below 54-55°F and snow-cover duration above 80 days
Boundaries of prefectures
Major cities
HOKKAIDO
HONSHU
SHIKOKU
KYUSHU
SEA OF JAPAN
PACIFIC OCEAN
SCALE
0 50 100 200 300 MILES
MERCATOR PROJECTION

Source: Based on Data from Ministry of Agriculture and Forestry, Japan

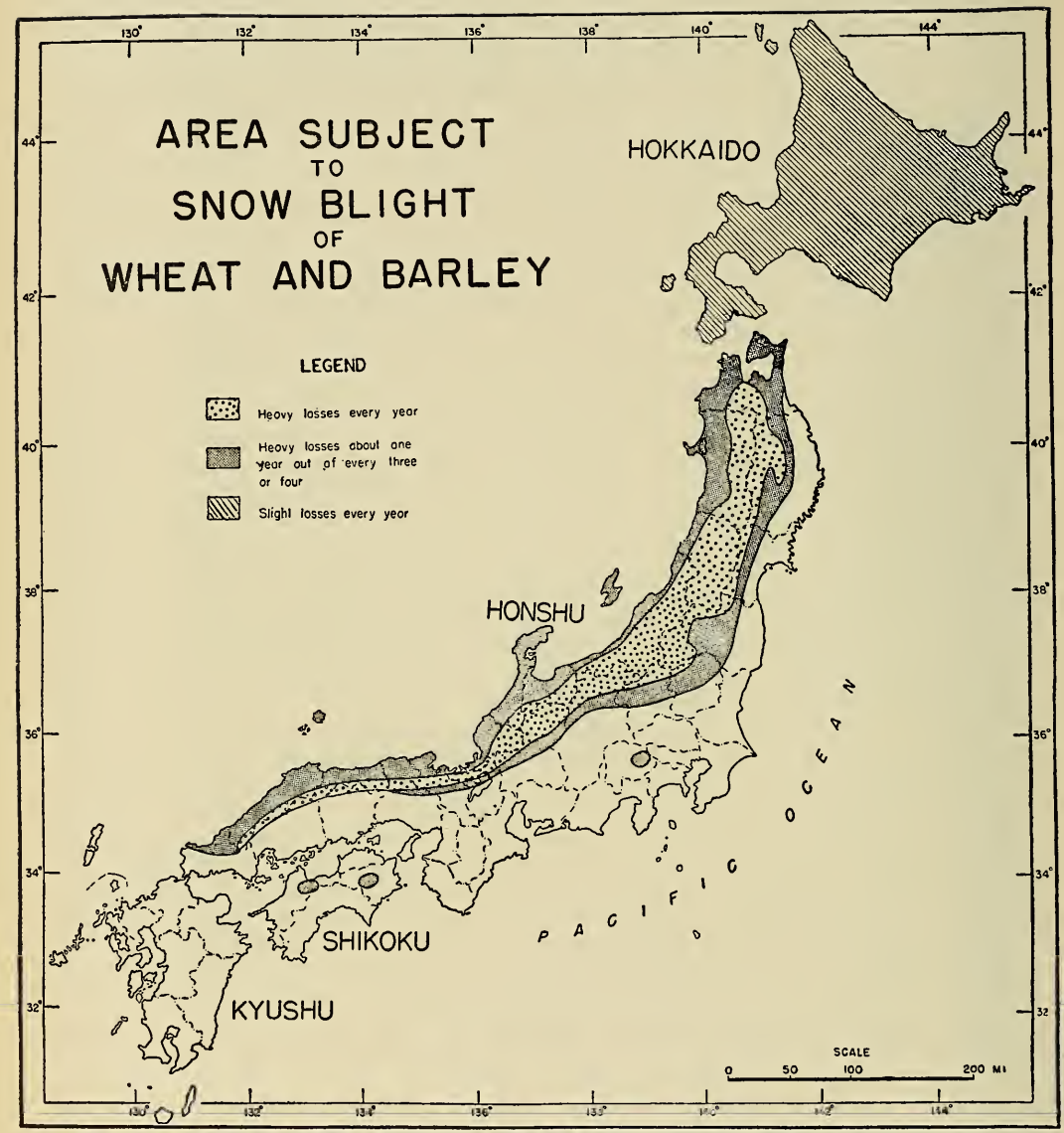
Figure 13

shima Prefecture in southern Kyushu, where the second crop will frequently again be irrigated rice, almost none of the fall-sown crops following rice on paddy land are irrigated. The most important of these winter-grown crops are wheat, barley, naked barley, rapeseed, beans, various vegetables, and leguminous green manure crops (Figure 16). There is also the fiber crop, mat rush (*Juncus effusus* Linn. var. *decipiens* Buch.), a plant from which *tatami*, the popular floor mats of Japan are made; it is propagated vegetatively by division of clumps, and is transplanted from nursery to paddy in the early winter with harvesting in July; it is grown chiefly along the shores of the Inland Sea.

For the most part the winter-grown crops following paddy rice are wheat and barley. North of the Kanto Plain (Figure 2) the growing season in most of the districts of Honshu and also in Hokkaido is not long enough, the fall and spring temperatures are often too low, and the snow-cover, especially on the Japan Sea side, is too heavy to permit winter-cropping of the paddy land, which, therefore, usually is left fallow during the winter season north of the 37th parallel. Generally, the mean annual temperature of 54° to 55° F. (Figure 13) is considered in Japan to be the extreme boundary of wheat and barley cultivation on paddy fields because in areas subject to lower mean annual temperatures the time interval between the ripening of winter grain and the transplanting of rice makes difficult the double-cropping of paddy land. In regions where the average annual temperature is about 54° F. the maturing of barley overlaps with the transplanting season of rice, while in regions of annual mean temperatures of about 55° to 56° F. the transplanting season nearly coincides with the period of ripening of wheat, hence the 54° to 55° F. boundary line of winter grain production on paddy land.

On the Echigo Plain (Figure 2) and other lowlands of the northern Japan Sea coast the growing season is moderately long but poor drainage and excessive snowfall are seriously limiting factors which often prevent the planting of winter grain, or, if it is planted, cause conditions conducive to disease. Heavy losses from snow blight of wheat and barley occur in areas where the snowcover is more than 20 inches deep and lasts over 90 days. This disease is most frequently found throughout the greater part of western Honshu (Figure 13A). Poor drainage of melting snow is believed to be a contributing factor in the occurrence of this disease, the cause of which is a fungus organism which decomposes live plant tissues covered by a deep snow over a prolonged period of time. Decayed leaves of the infected plants can be seen immediately following the melting of the snow. While wheat and barley are badly affected by snow blight, rye appears to be relatively more resistant to it.

Poor soil drainage conditions which make difficult the removal of water from the inundated fields constitute also a major limiting factor in the growing of winter crops on paddy land in a considerable number of



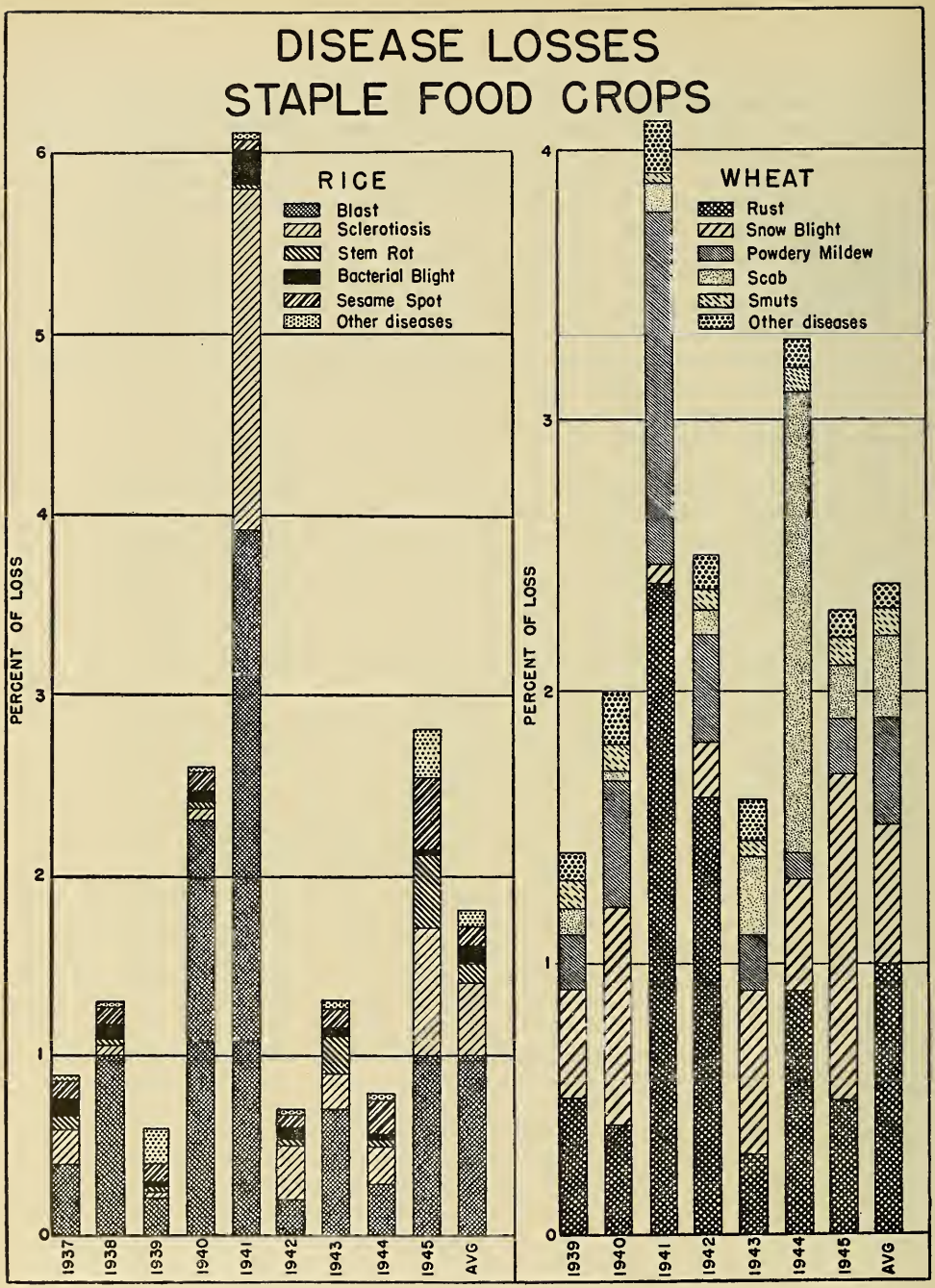
Source: Natural Resources Section GHQ SCAP

Figure 13 A

local areas in central and southern Japan. Thus, more than half the total area of irrigated rice fields of Japan cannot be used for another crop after rice has been harvested because of temperature, snowfall, and soil-drainage conditions, as well as because of insufficient irrigation water in some areas, which necessitates the local use of paddy fields for water storage during the winter season.

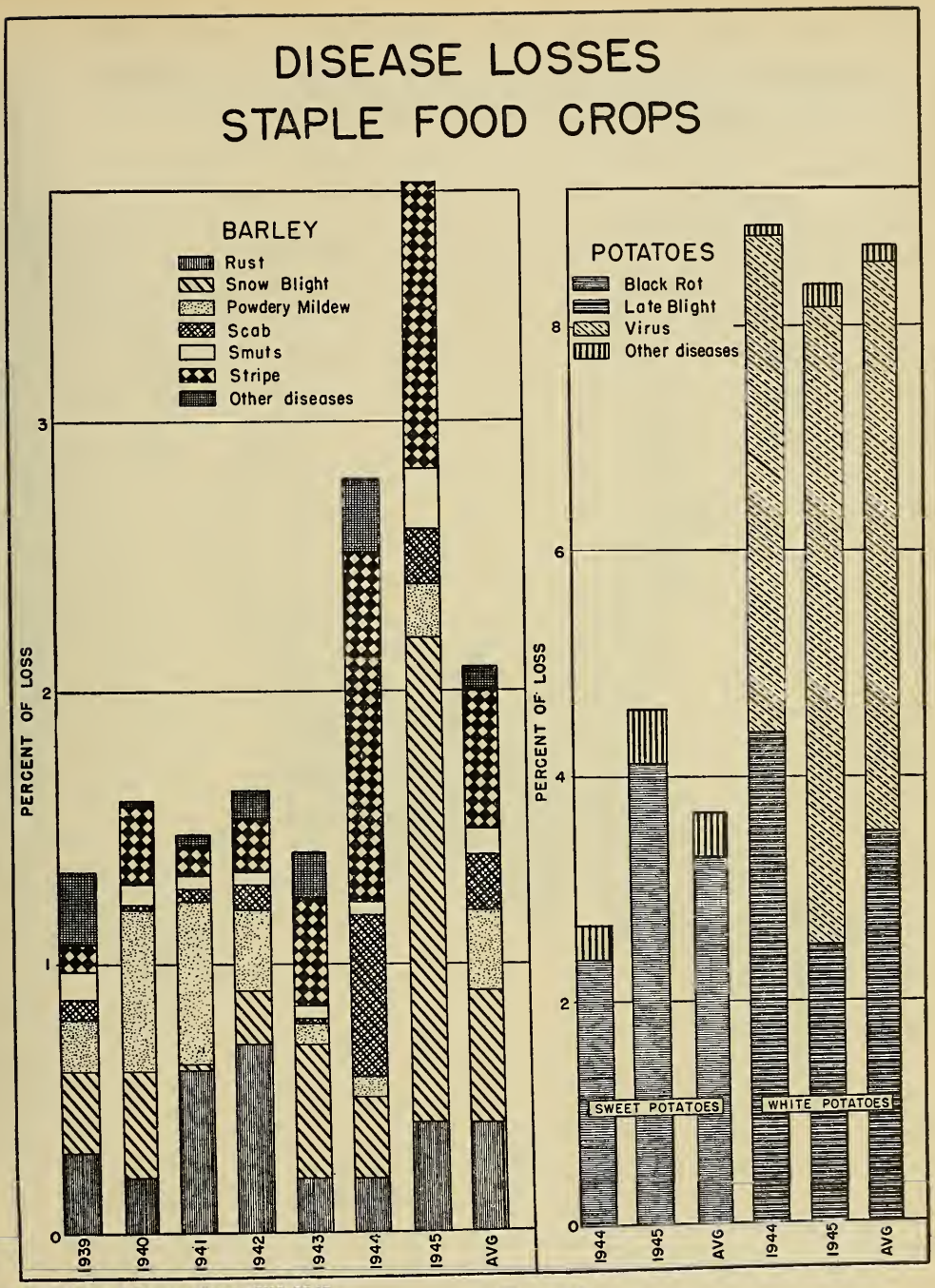
Shortage of labor during the busy transplanting and harvesting seasons of rice, also, is among the major factors in limiting double-crop production in certain parts of the country. The interrelationship between the mean annual temperature and winter-cropping of paddy fields, that is, the isotherm line of 55° F. serving as the marginal line for double-cropping of paddy fields (Figure 13), is largely the result of the time and labor element involved. The time interval from harvesting wheat and barley to transplanting rice in the spring and that from harvesting rice to sowing wheat and barley in the autumn becomes progressively shorter in the regions of lower annual temperature found in the north or in areas of higher elevation, until the point is reached where it is physically impossible to plant more than one grain crop per year on paddy land. Barley is usually harvested in Japan earlier than wheat (Figure 11D); it is harvested about one week earlier than wheat in the north, and two weeks earlier in the south. The number of days between harvesting of barley and transplanting of paddy rice throughout Japan is given in Figure 14. Similarly, the number of days between harvesting of paddy rice and sowing of winter cereals is given in Figure 15.

Where soil drainage is fairly satisfactory, temporary drainage ditches are made in the paddy fields prior to the harvest of rice in order to facilitate the drying of soil; in case the time interval between the harvest of rice and the planting of winter cereal is short, the land is spaded or plowed, and soil is heaped into low ridges on which seeds are sown as soon as possible; where the time permits it, the field is left to dry for a few days after the harvest before it is prepared for planting winter grain. Where, as is more often the case, the drainage of paddy land is poor, the soil after being plowed or spaded is thrown into high ridges. After the land has been permitted to dry for a few days it is harrowed, and ridges are repaired, fertilized, and seeded to winter crops. The height of the ridges and the distance between them varies in accordance with relative dryness of the soil, being about 2 or 3 inches in well-drained soils and as much as 16 inches in waterlogged soils. The width of the ridge surface or of the raised bed ranges from 16 to 40 inches or more. Sometimes ridges a foot or more in height, over 3 feet wide on top, and up to 6 feet apart are made on very poorly drained land, and the intervening depressions are frequently flooded by winter rains. These high ridges often accommodate only one or two rows of the winter crop. Leonard states that sometimes the very wide ridges made on paddy fields are planted to barley



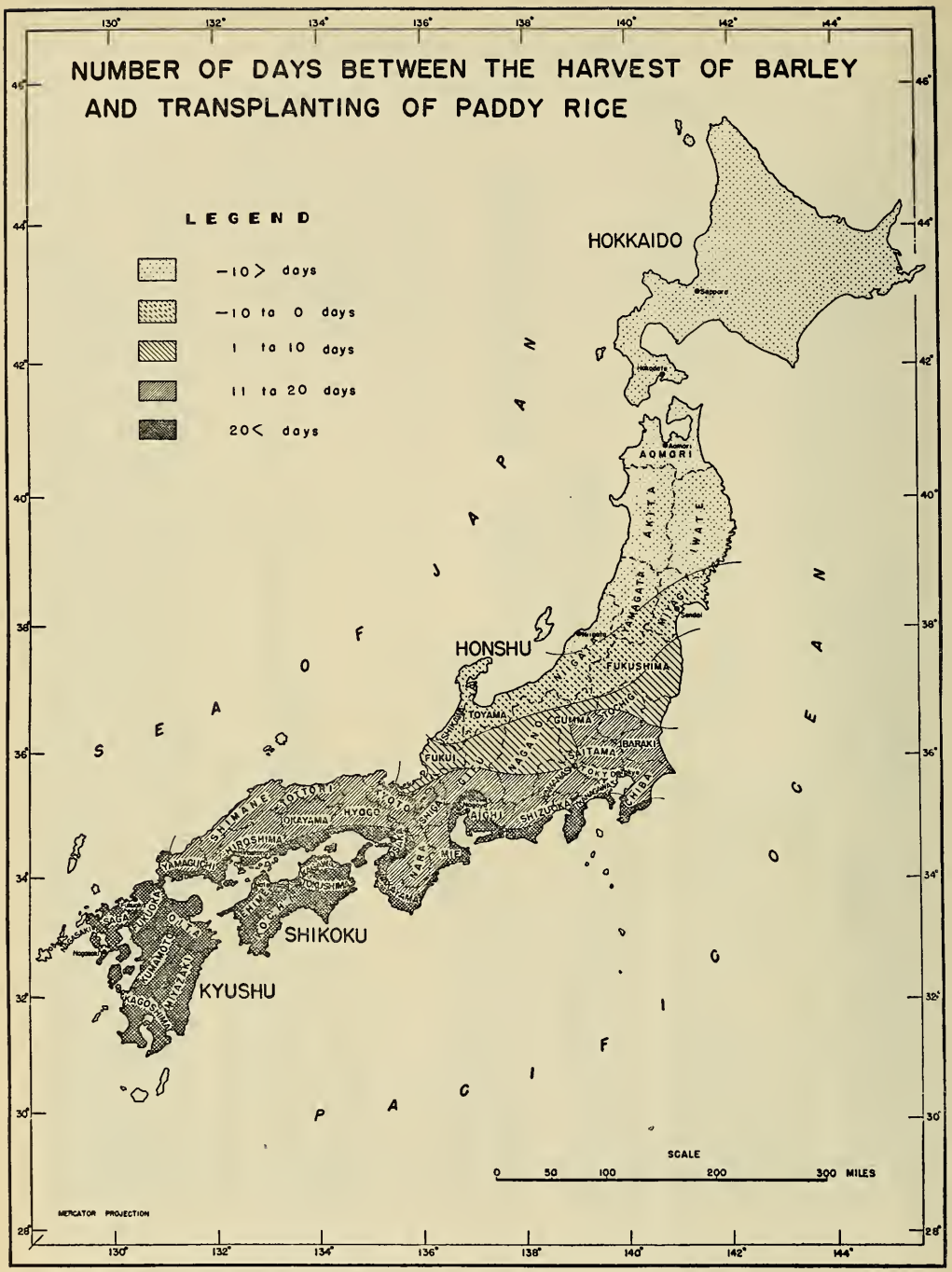
Source: Natural Resources Section GHQ SCAP

Figure 13 B



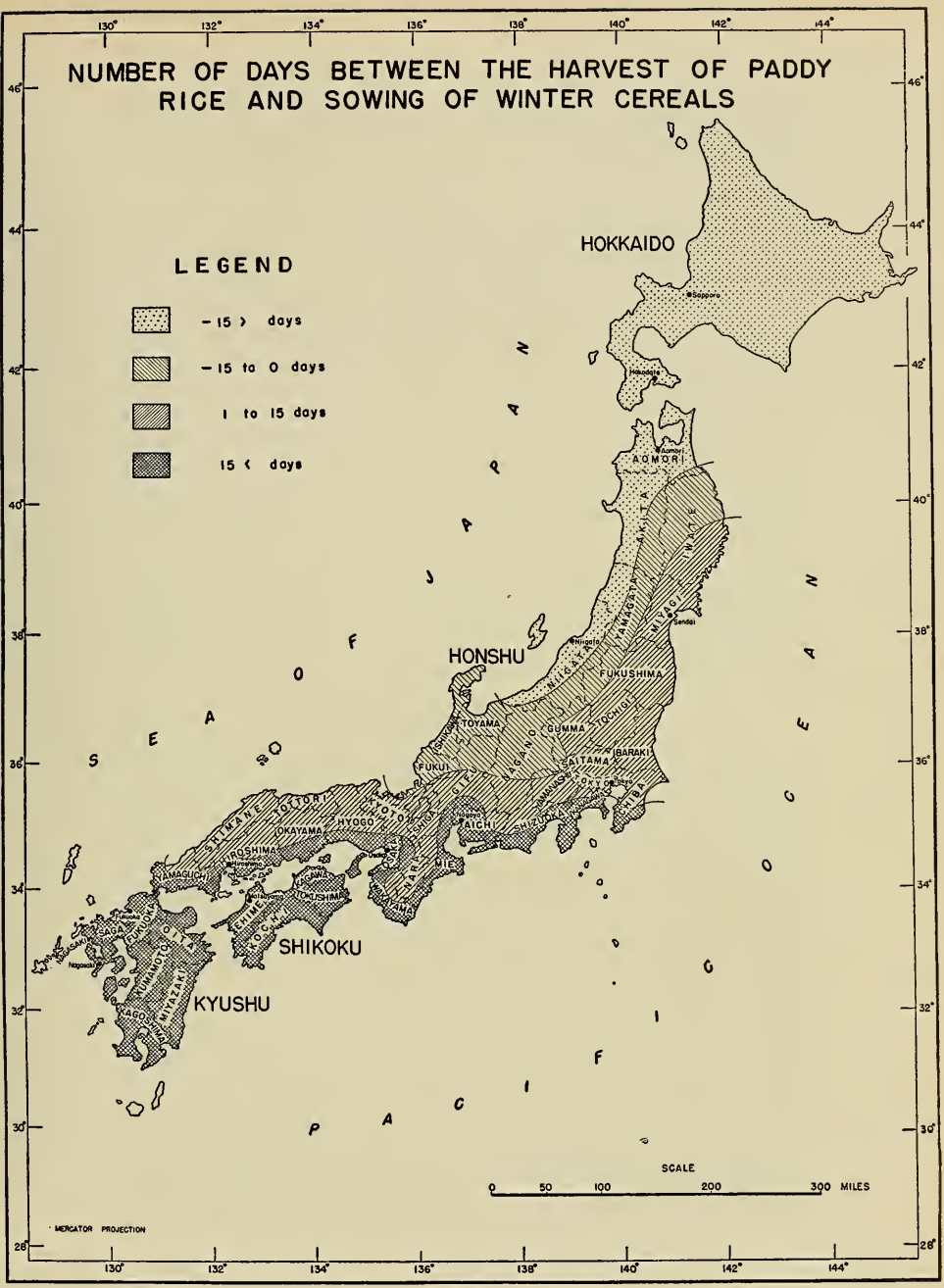
Source: Natural Resources Section GHQ SCAP

Figure 13 C



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 14



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 15

in 12-inch drills at right angles to the direction of the ridge, and that, though the high ridges built in areas of difficult drainage involve a large amount of hand labor, they are very efficient in drying the soil during winter.

Planting barley after rice on paddy fields without plowing the land is practiced in Japan in areas where alternation of crops prevails widely (Figure 16) and where limitations of climate make it necessary to plant fall-sown grain as soon as possible after the removal of the rice crop (Figure 15). Leonard describes a number of methods used in Japan in planting barley after rice without plowing the land, namely: (1) the temporary low-ridge method, which consists of preparing with a hoe the locations where plants are to be grown, ridging up these areas, sowing the seed on ridges, and covering seed with a mixture of barnyard manure, soil, and fertilizer; (2) sowing in furrows, a method which is practiced in soil areas of fairly good drainage and which consists of making shallow furrows with a hoe, sowing seed in these furrows, and covering seed as outlined with the preceeding method; and (3) sowing in holes, a method rarely used, which requires very good soil drainage conditions. This third method consists of killing weeds after the harvest of rice, using a wooden rod to make holes about an inch in diameter between rice stands, covering the holes with barnyard manure and fertilizers, and sowing a few seeds per hole; except for removal of large weeds once or twice during the growing period, no further attention is given to the crop.

Upland (Nonirrigated) Crops

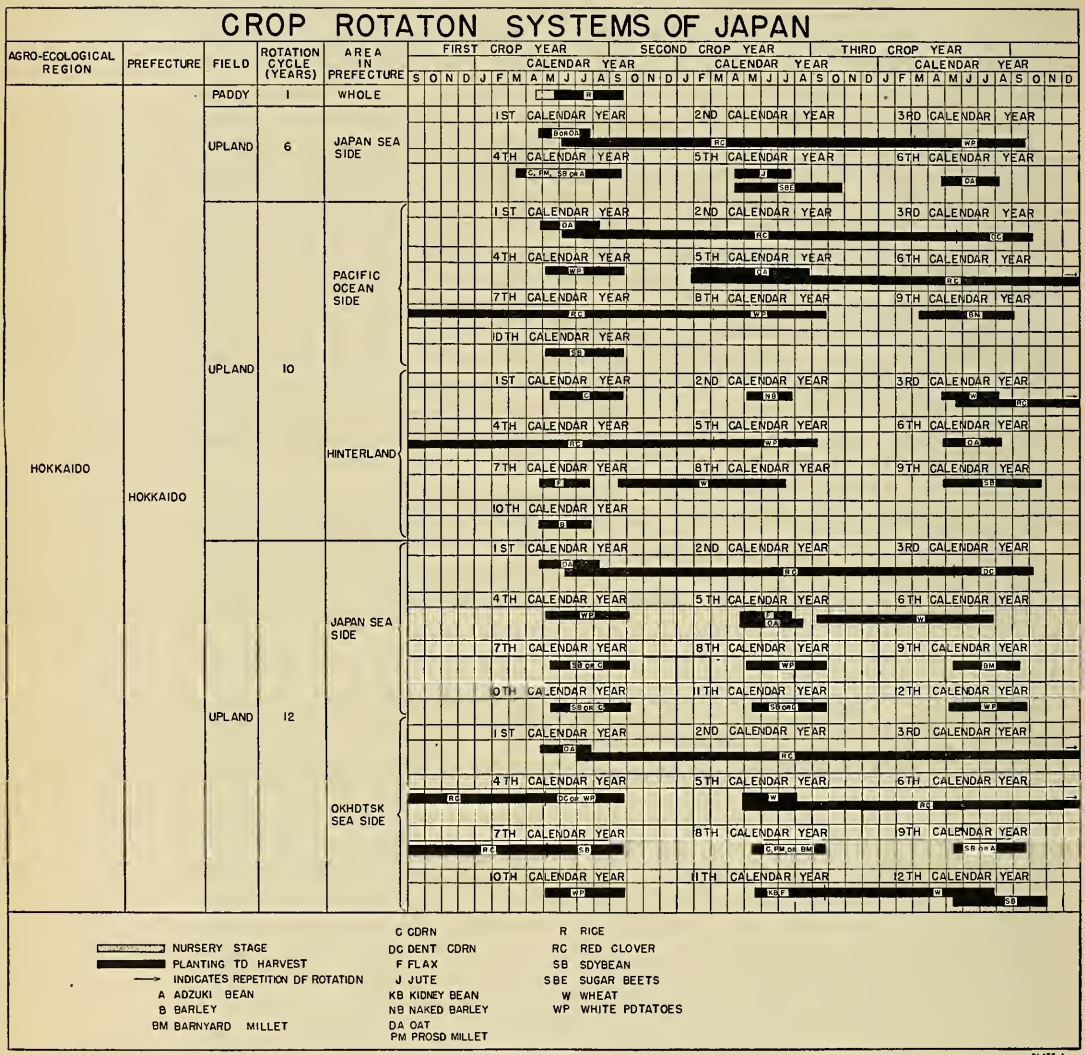
Unlike paddy land in which irrigated rice is the only crop produced during the warm part of the year and where only a fraction of the acreage is given to a few winter-grown crops, the upland[3] soils of Japan are devoted to a very great variety of crops. Winter-cropping of upland fields is much less restricted than winter-cropping of paddy fields. There is a wide choice of summer-grown upland crops and these can be selected so that their growing period will not interfere with seeding and harvesting requirements of winter crops. Moreover, it is rather a common practice to have alternate rows of different upland crops grown together in the same field. These are often planted at different times and fall-sowing of winter crops between rows of summer-grown upland crops or spring-sowing of summer crops between rows of winter crops is rather common. Such an interculture or inter-cropping system and also double-cropping and multiple-cropping—the latter especially characteristic of the more southern regions—are practiced widely in the upland areas.

[3] The terms "upland soils" and "upland crops" do not necessarily imply soils or crops at high elevation. Rather, the use of the word "upland" indicates that the land is not under water much of the year—in contrast to paddy land. Much of the cultivated upland area of Japan lies on very slight elevations in broad valleys or along coastal strips that would, in America, be considered lowlands. Upland fields, however, may be found on very steep mountainsides throughout the country.

Multiple-cropping consists of planting a succession of a few crops such as early vegetables, buckwheat, and barley, or early vegetables, late vegetables, and wheat. When two or more crops are planted to a field in one cropping season, inter-cropping, alternate strip-cropping, mix-cropping, and border-cropping are employed. Inter-cropping, as stated, consists of the planting of one or more different crops between rows of a given crop. Alternate strip-cropping involves the planting of several rows of one crop between rows of another crop; thus, planting of several rows of soybeans between rows of corn is an example of alternate strip-cropping, and this appears to be fairly popular in the corn-growing areas of Hokkaido. Mix-cropping or the mixed planting of two or more different crops consists of a number of practices, some of which are: (1) planting different crops between hills of another crop or "inter-hill planting"; (2) planting different crops at random within the stand of another crop or "random mix-planting"; and (3) mixing seeds or seedlings of different crops before sowing or planting or "straight mix-sowing or mix-planting." Border-cropping consists of the planting of different crops around the field of another crop.

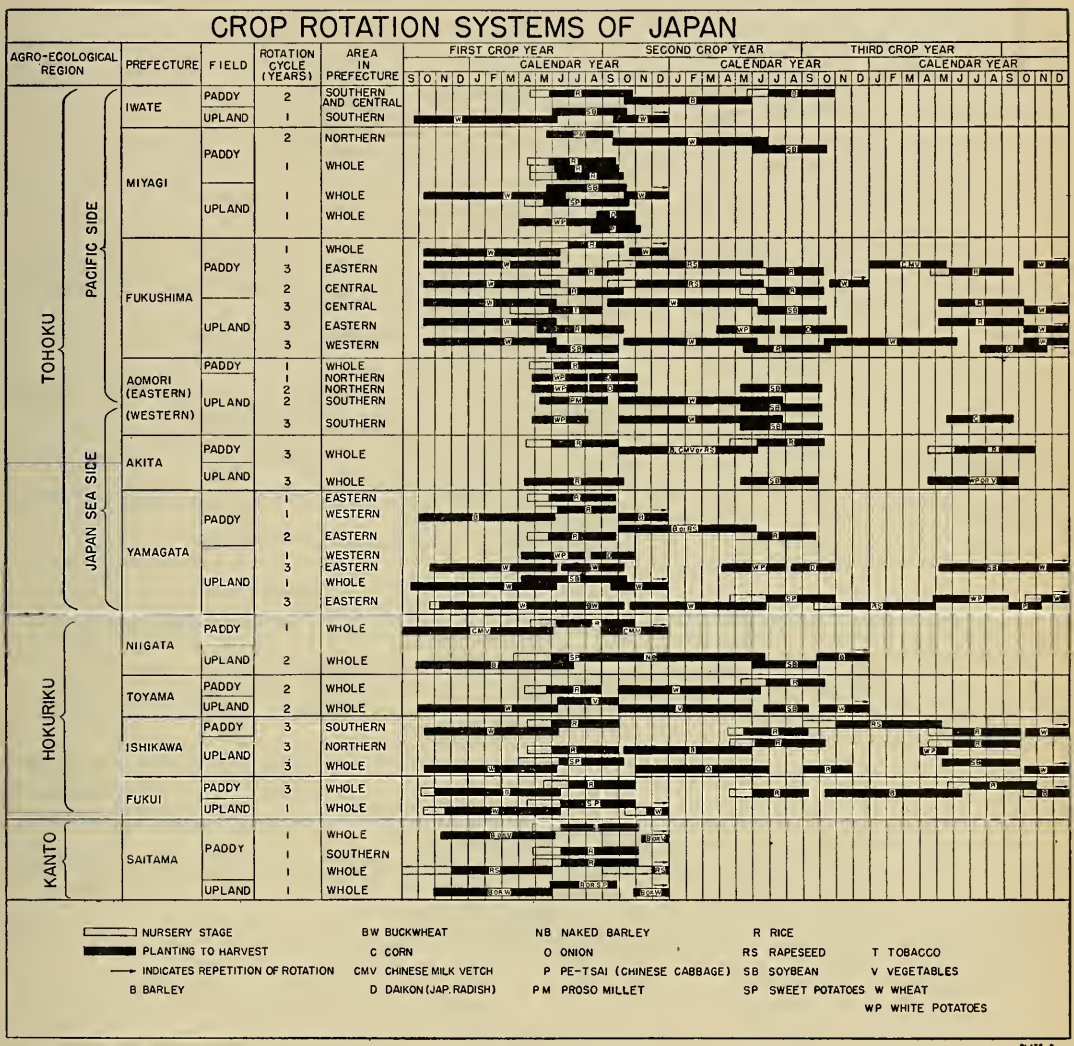
Crop rotation practices in Japan vary considerably throughout the country (Figure 16) and the concept of a crop rotation in Japan often implies the number of crops per year that can be grown one after another on the same field, or the number of different crops grown simultaneously in the same field. The type of rotation ranges from one crop per year in Hokkaido and northern Honshu, to two crops per year in many parts of central and southern Honshu, and to three crops per year in the warmer areas of southern Honshu, Shikoku, and Kyushu.

Wheat, barley, naked barley, rapeseed, and some vegetables are the major winter season crops throughout Japan, except for Hokkaido where most of the crops grown are spring-planted though winter-cropping in some parts of the island is a rather common practice. In some of the northernmost areas of Honshu small grains are often seeded in the spring, too, though fall-sown winter grain predominates throughout northern Honshu. White potatoes are important in Hokkaido, and sweet potatoes are important on the other three islands. The main summer grain crops of the uplands of central and southern Japan are buckwheat, several millets, nonirrigated rice, and corn. Soybeans, red or adzuki beans, kidney beans, horse or broadbeans, and other beans, and a great number of other vegetable crops are important in the upland areas. The sweet potato, the white potato, various kinds of beans, and the *daikon* or giant white radish (*Raphanus sativus* Linn. var. *acanthiformis* Mak.) are among the most widely used vegetables of Japan. During the summer period most emphasis is placed on vegetables, the growing of which is widespread throughout the country and most concentrated in close proximity to large cities. Several crops of vegetables are usually grown together in rows in



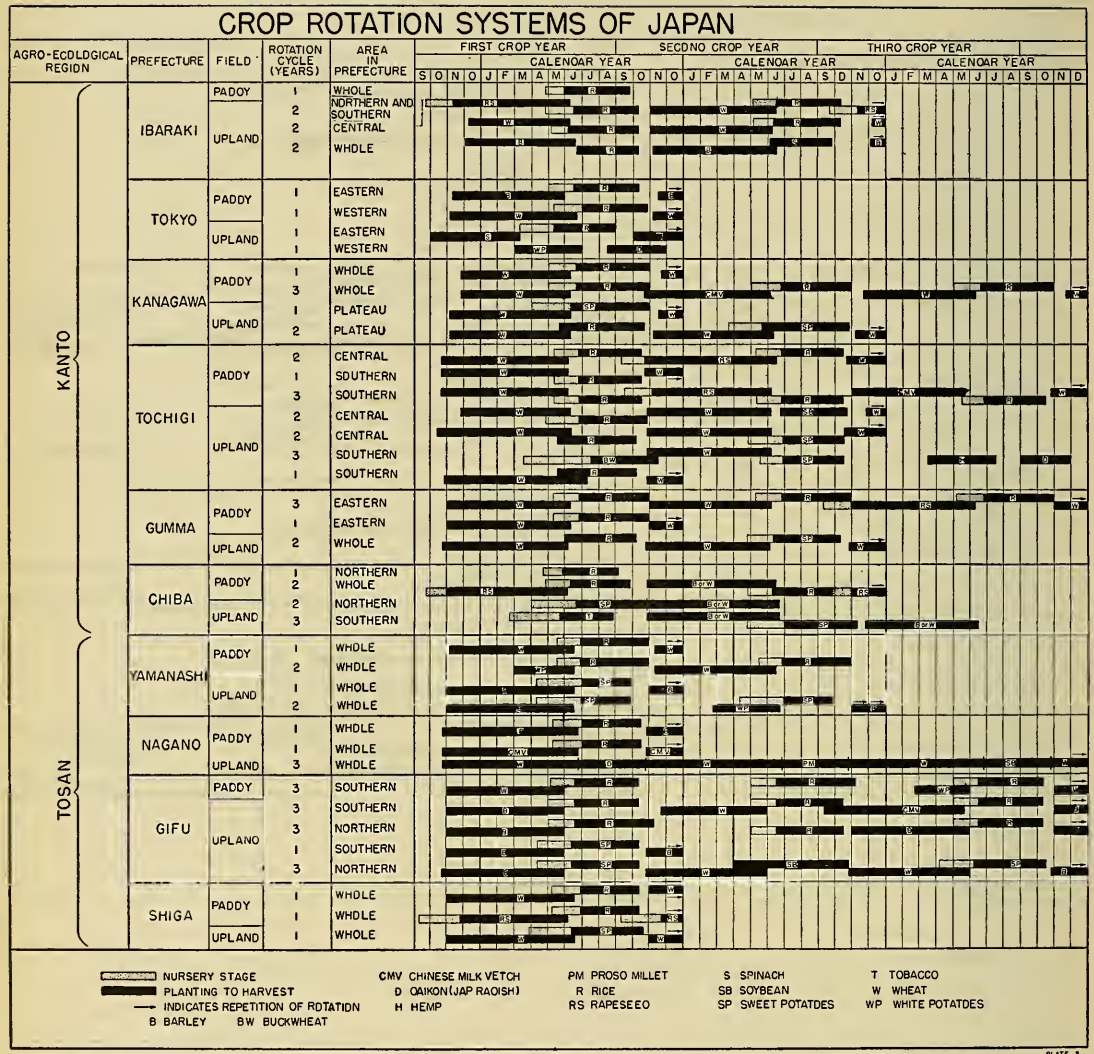
Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 16



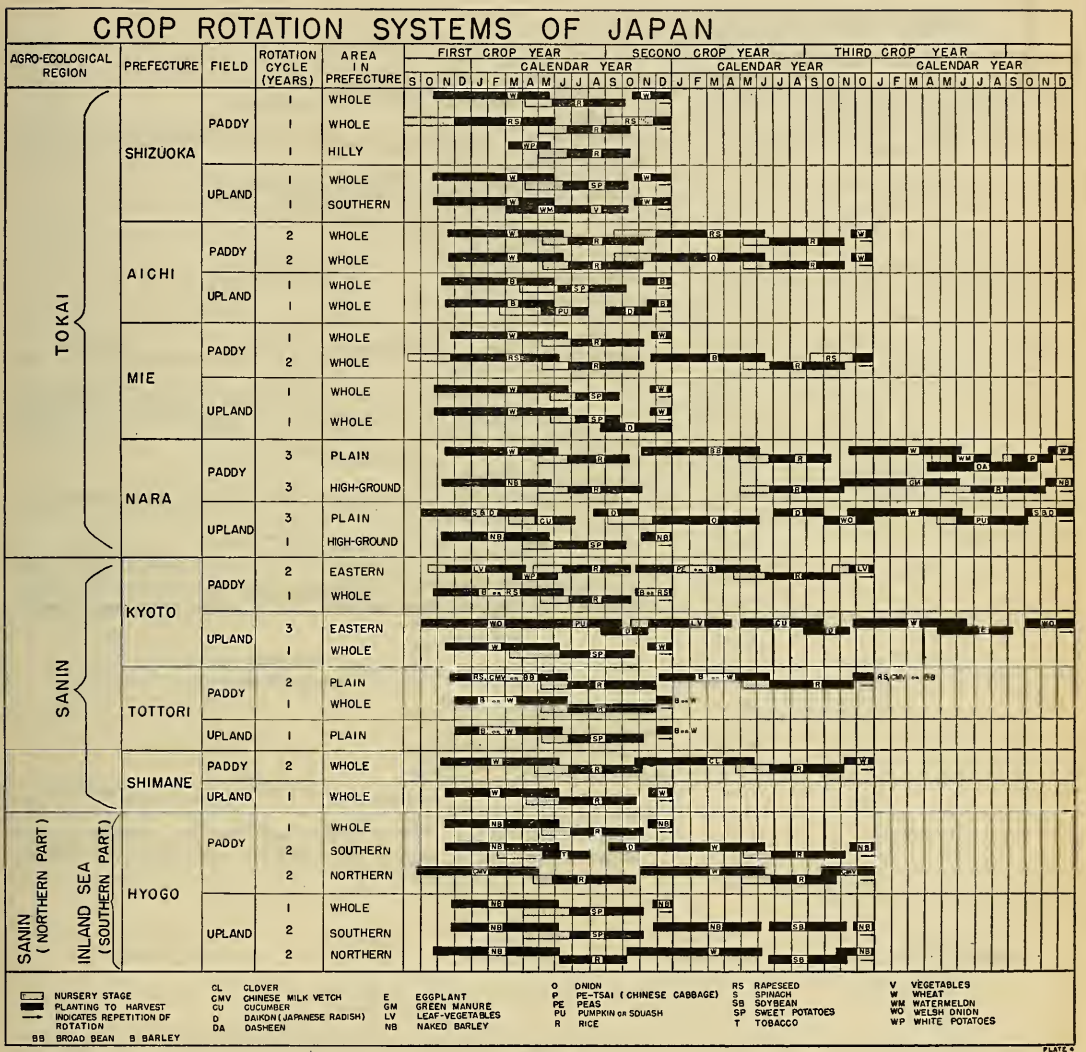
Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 16 (Cont'd)



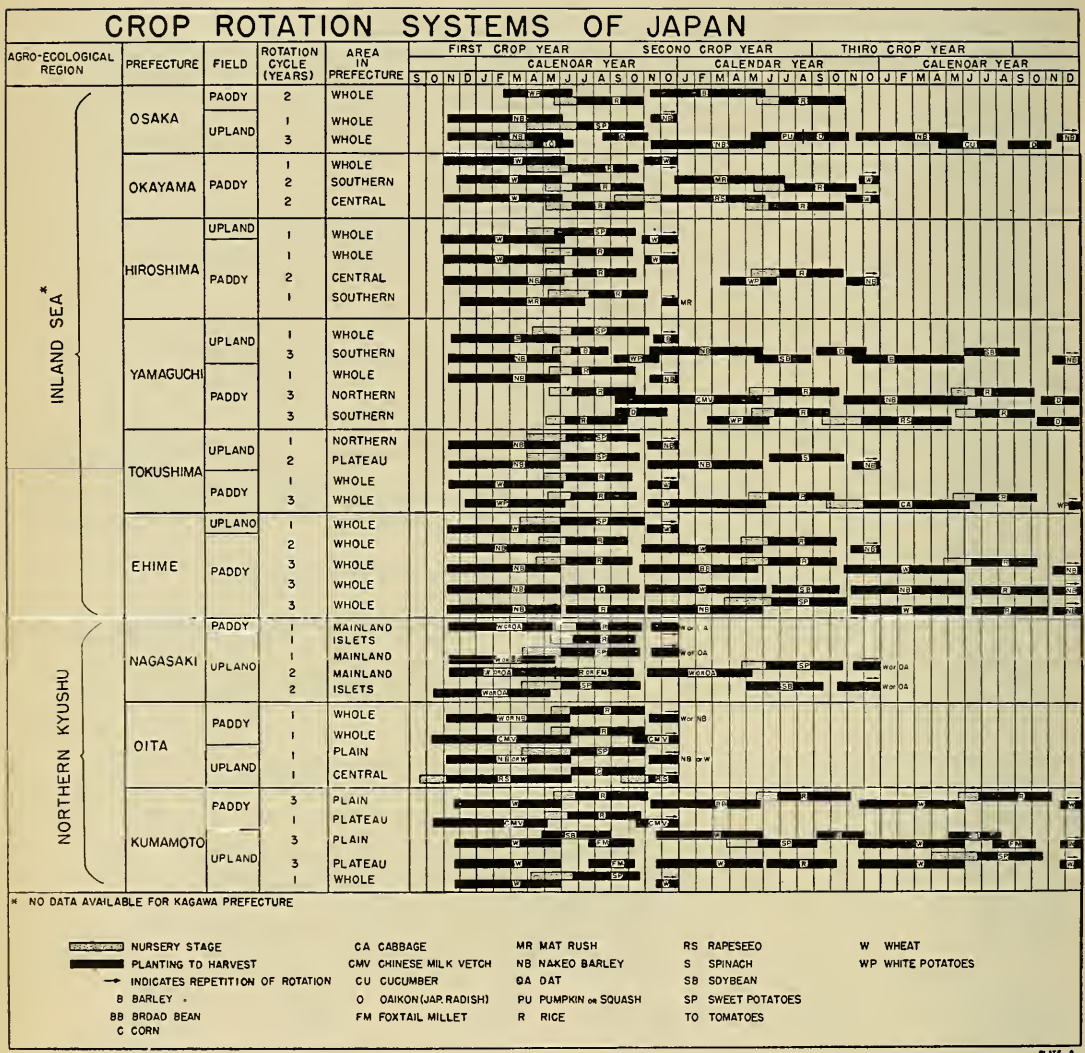
Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 16 (Cont'd)



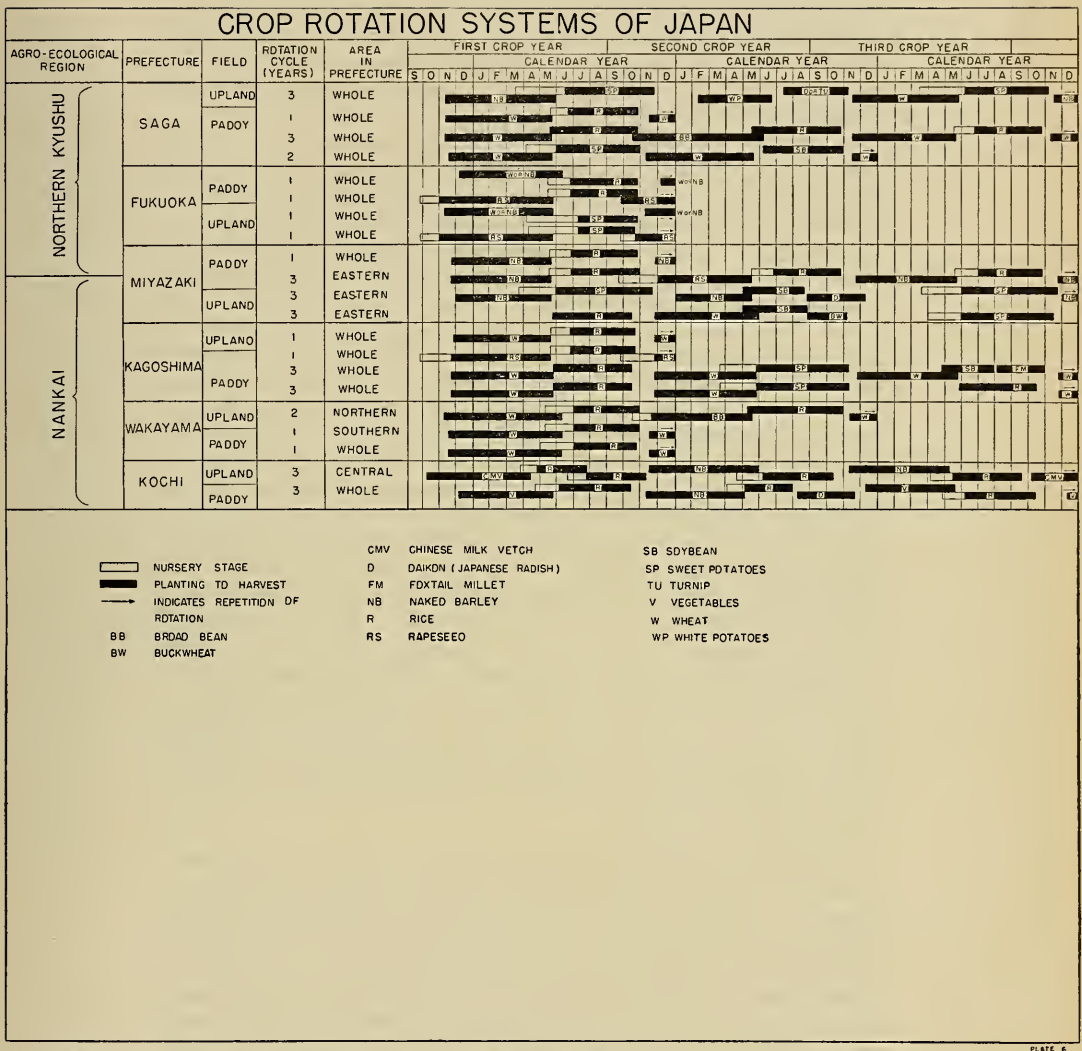
Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 16 (Cont'd)



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 16 (Cont'd)



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 16 (Cont'd)

the same field. Buckwheat, the several millets, and beans are usually grown in the steeper upland areas. Silkworm mulberry is an important industrial crop of the uplands grown largely in the mountain basins, on mountain slopes, and on light soils from northern Honshu southward (Figure 3).

Some of the upland crops of lesser importance, though grown in many different parts of the country, are concentrated as to area of principal production (Table XIV). Rapeseed and sesame, which are the main vegetable oil crops of Japan, are grown in the upland areas between Ise Bay (bordering Mie and Aichi Prefectures) and Lake Biwa (Shiga Prefecture), and on the island of Kyushu. (Soybeans though grown widely throughout the country are used chiefly for purposes other than processing of oil.) Sugar beets, flax, pyrethrum, and peppermint are produced principally on the uplands of Hokkaido; hemp is grown largely in northern Kanto; tobacco is produced mostly in northern Kanto and southern Kyushu; reeds and rushes are grown generally along the shores of the Inland Sea; tea is cultivated principally in Shizuoka Prefecture and in the Kyoto vicinity (Figure 3). Apple orchards are found in northern Japan, while citrus plantings (mainly Satsuma oranges) are limited mostly to steep hillside slopes of the warmer areas bordering the Pacific in Shizuoka Prefecture and to warm areas along the Inland Sea (Figure 3). Individual trees of various orchard species are found on many Japanese farms throughout the country. A complete list of the major fruit species and their main varieties grown in the various areas of Japan is given in Table XV. Satsuma oranges, apples, persimmons, Japanese pears, Japanese plums, peaches, grapes, and loquats are the most common fruits.

Grains occupy a most prominent place on the upland farms of Japan. Wheat, barley, and naked barley are the major winter-grown cereals. They are also among the most important spring-sown cereals of upland farms on Hokkaido and in some areas of northernmost Honshu. Among upland summer grains, which include buckwheat, the millets, and corn, some upland rice is raised.

Wheat and barley compete for land in Japan. Fall-sown wheat, naked barley, and barley are grown in paddies as well as in the upland fields of the country. As barley ripens somewhat earlier than wheat, cultivation of it permits a little more time for the planting of rice in paddies and for earlier planting of upland summer crops. Wheat is the second most important cereal of the country (rice being first), with naked barley and common barley following wheat. The combined acreage of naked and common barley, however, is second only to that of rice (which was in 1950 about 7,502,770 acres). In 1950 wheat occupied nearly 1,886,980 acres in Japan, naked barley about 1,459,600 acres, and common barley approximately 982,340 acres. The 1947 relative acreage of wheat and the two barleys on paddy fields and on upland fields as well as the total areas of

paddies and upland crops in each of the seven districts of Japan's national agricultural experiment stations (Figure 17) are given in Figure 17A. Some of the data in relation to cropping practices of these districts could be summarized as follows:

Hokkaido District—wheat and barley are cropped here only on upland fields; spring wheat, winter wheat and spring barley are sown throughout a large part of the island; winter barley is grown to some extent in the southern peninsular area.

Tohoku District (northern Honshu)—wheat and barley are cultivated here chiefly on upland fields and to some extent on paddies in the southern part; winter varieties of wheat and barley resistant to cold and snow-injury predominate; a small northernmost area is given to spring wheat and barley.

Kanto-Tosan District (central Honshu)—winter-grown wheat and barley are cultivated here; most of the winter grain is grown on upland fields, though a considerable paddy acreage is given to these cereals.

Hokuriku District (western Honshu)—winter-grown wheat and barley cultivation is rather limited in paddies as well as on the relatively few local upland fields because of the high percentage of very wet paddies (farmers often harvest rice in boats), and because of heavy snowfall; varieties resistant to snow-injury are required here.

Tokai-Kinki District (southeastern Honshu)—winter-grown wheat and barley are cultivated in paddies and to some extent on upland fields; high-ridge cultivation is practiced extensively in poorly drained paddy fields.

Chugoku-Shikoku District (southwestern Honshu and Shikoku)—winter-grown wheat and barley are cultivated chiefly on paddy land with some limited acreage on upland fields.

Kyushu District—winter-grown wheat and barley are cultivated on paddies and upland fields; winter-cropping of paddies predominates in the north; wheat and barley are cultivated mainly in upland fields in the south.

Except in Hokkaido, the wheats generally grown are soft red winter or spring wheats seeded in the fall, the latter being limited to Kyushu and southern Honshu. Conspicuous features of most varieties are early maturity, profuse tillering, and short, stiff, nonlodging straw.

Much of the fall-sown wheat and barley in southern and western Japan consists of spring-type varieties, as the winters are relatively mild there and winter wheat does not head well in warm winter areas; spring varieties can be harvested earlier than winter-type varieties grown in colder regions of the country. Generally speaking, the wheat varieties grown in warm regions of Japan are mainly fall-sown spring wheat varieties and intermediate-type wheat varieties. If spring wheat varieties are planted too early in fall the heading stage may begin before the winter

is over, resulting in weaker plants and poorer yields. Hence, spring wheat varieties are planted later than intermediate wheat. This spread in time of fall-planting of the two types of wheat permits the Japanese farmer more leeway in planting fall-sown wheat and provides for him an opportunity to choose his type of wheat in accordance with his farm work time schedule.

Most of the wheat varieties of Japan tiller more (5 to 10 times as much), have a higher number of seed per head, and a shorter head than American varieties tested out in Japan. Japanese wheat varieties as a whole appear to be on the average three weeks to a month earlier in maturity than a great many of the American wheat varieties that so far have been introduced and tried in Japan. This seems to be true in reference to fall-sown spring wheat and winter wheat varieties introduced from America. Thus, at the Tokai-Kinki National Experiment Station, the American spring wheat varieties Marquis and Ceres and the winter variety Turkey, sown in autumn, were fully headed about mid-May and were mature in late June or early July; while the Japanese fall-sown spring wheat and winter wheat varieties planted alongside were fully headed in late April and ripe in early June. From the not-too-extensive field tests conducted in Japan it appears that so far the few American wheat varieties introduced have been found not only to mature too late but also to grow too tall and to lodge badly in the usually heavily fertilized Japanese fields. They have been found, also, to be more susceptible in some areas to certain diseases than are the better Japanese varieties.

Progress in crop improvement in Japan has been brought about largely by pure line selection, introduction of new varieties, and hybridization. Reviewing the history of wheat cultivation in Japan, Salmon states that wheat occupied a relatively minor position in the country until the early 1930's, when a marked increase in planted acreage and in yield per unit area resulted through a coordinated effort on the part of Japan's agricultural experiment stations in breeding and selecting new early-maturing and disease-resistant varieties, in using more extensively and more efficiently the mineral fertilizers, and in developing better cultural practices; that crosses between native wheat varieties and those of foreign origin have played an important role in the improvement of wheat in Japan and the present proportion of these new varieties of hybrid origin to the total wheat acreage exceeds 66 per cent, reaching in some prefectures 80 per cent; and that although there are many popular wheat varieties occupying considerable acreage, none is a widely adapted variety, witnessed by the fact that none occupies as much as 10 per cent of the total wheat area, because of the wide range in climatic conditions and because of different diseases (Table XVI) prevailing in different parts of Japan. Efforts to improve varieties of wheat by breeding have followed much the same general pattern as for rice. Resistance to diseases, especially scab,

leaf, stem, and stripe rusts, and snow damage, are important objectives. Scab is especially important in Kyushu and in southwestern Honshu. Considerable progress in breeding for resistance to this disease has been made, but to what extent this has been due to producing early varieties that escape damage and to what extent due to inherent resistance to the disease cannot be decided with available evidence. Damage certainly has not been eliminated, though losses probably are less than in certain areas in the United States. The fact that practically no corn is grown in this section of Japan and that much of the inoculum is destroyed by working plant residues into the soil is believed to have an important bearing on the relative prevalence of the disease in the two countries.

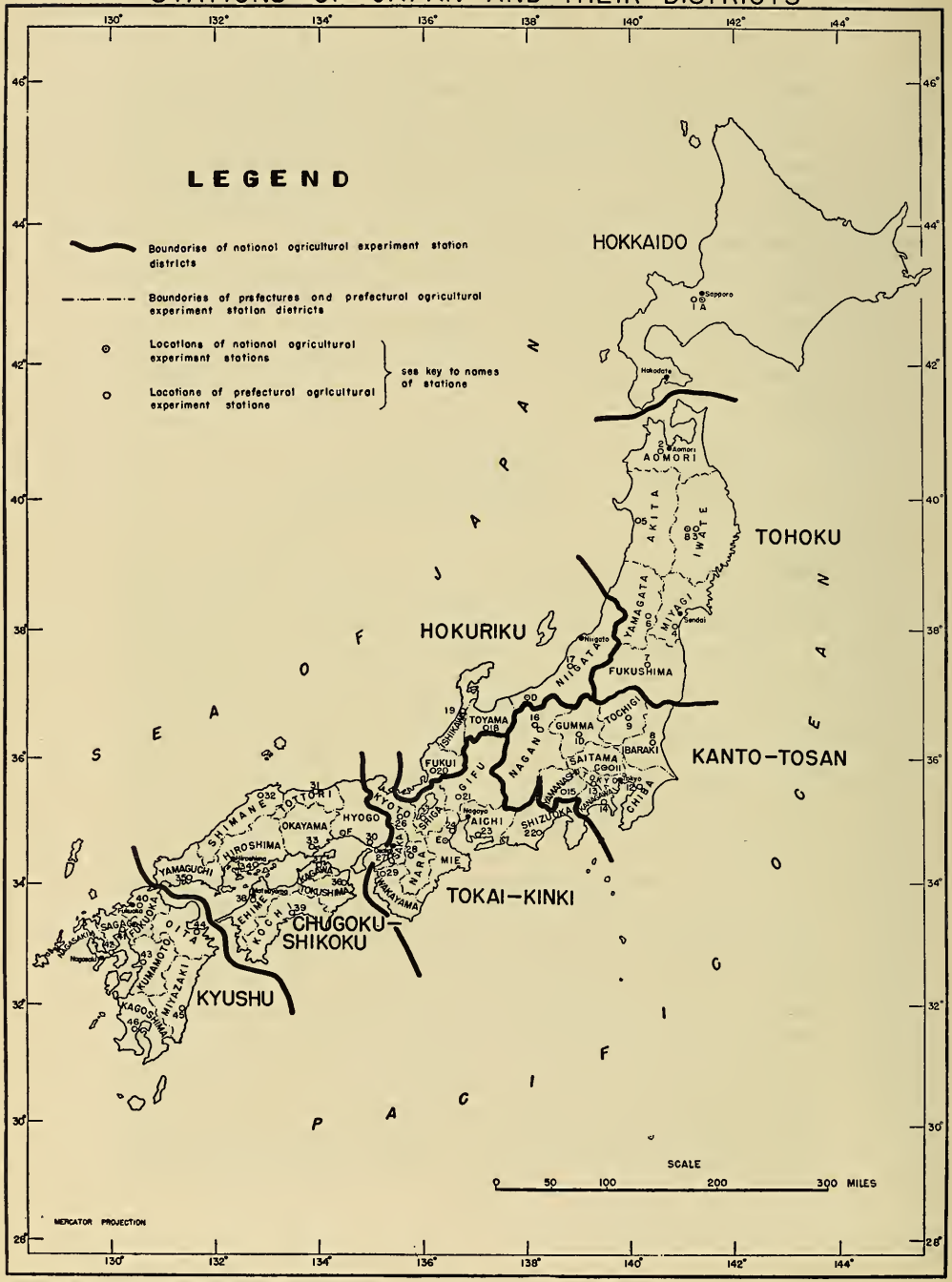
Some better new fall-sown varieties of wheat and the districts (Figure 17) where they are grown are listed by Salmon somewhat as follows:

Tohoku	Norin Nos. 39, 44, 16, 24
Hokuriku	Norin Nos. 4, 25, 43
Kanto-Tosan	Norin Nos. 26, 50, 9, 16, 27
Tokai-Kinki	Norin Nos. 26, 50, 9, 16, 27
Chugoku-Shikoku	Norin Nos. 20, 45; Ejima-Shinriki
Kyushu	Norin Nos. 20, 45, 34, 36; Ejima-Shinriki

Some of the spring-sown varieties of wheat listed by the Ministry of Agriculture and Forestry of Japan, all grown in Hokkaido, are: Norin Nos. 29, 3, 35, Hokkai Nos. 215, 178, and Apporo-harukomugi Nos. 9 and 10.

Field practices commonly employed in upland fields in the growing of winter cereals usually involve liming the soil after the preceding summer crop has been harvested, plowing or spading and harrowing or hoeing the soil, leveling and fertilizing the soil, and sowing seed. Tanada and Swanson in their report on fertilizer practices in Japan state that most of the fertilizers for wheat, barley, and naked barley crops are applied during the fall months; that methods of application vary greatly; that the recommended amounts of plant food, from all sources, average per acre approximately 120 pounds of nitrogen, 65 pounds of phosphoric acid, and 70 pounds of potash; that top-dressing is usually used throughout Japan in two or more applications made from November to the end of May. They further state that commercial fertilizers, often together with compost, if applied at planting time are usually placed in a furrow made with a plow or hoe and are covered with a few inches of soil; seeds are then planted above the covered fertilizers. If no application of fertilizer is made before planting, the fertilizer is distributed along the rows of plants (or ridges) and worked into the soil through cultivation. Where heaving of soil constitutes a problem, as in some sections of the Kanto Plain, the fertilizers are mixed with compost and seed and pressed into small balls, and these balls are placed in small holes and covered with soil. Sowing of the seed-fertilizer-compost mixture in furrows without compressing it

NATIONAL AND PREFECTURAL AGRICULTURAL EXPERIMENT STATIONS OF JAPAN AND THEIR DISTRICTS



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 17

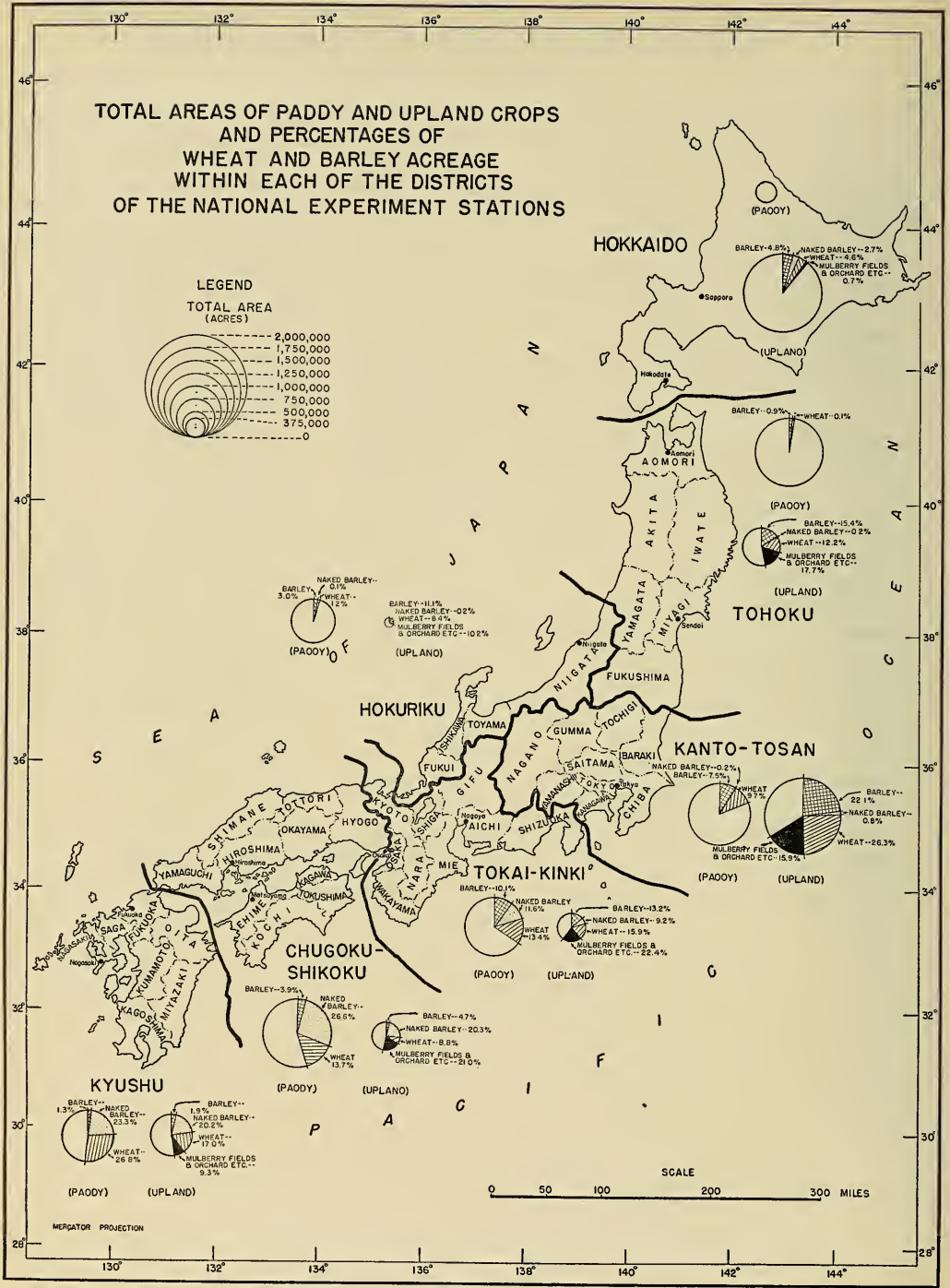
KEY TO NAMES AND LOCATIONS OF NATIONAL AND PREFECTURAL AGRICULTURAL EXPERIMENT STATIONS OF JAPAN PLOTTED ON MAP

National Agricultural Experiment Stations (Total 7)	
Name of Station	Location
A. Hokkaido	Kotani-machi, Sapporo-gun, Hokkaido
B. Tohoku	Morioka-shi, Iwate
C. Kanto-Tosan	Konosu-machi, Kitaadachi-gun, Saitama
D. Hokuriku	Shindo-mura, Nakakubiki-gun, Niigata
E. Tokai-Kinki	Isshinden-machi, Kuwana-gun, Mie
F. Chugoku-Shikoku	Himeji-shi, Hyogo
G. Kyushu	Hainutsuka-machi, Yame-gun, Fukuoka

Prefectural Agricultural Experiment Stations (Total 46)	
Name of Station	Location
1. Hokkaido	Kotoni-machi, Sapporo-gun, Hokkaido
2. Aomori	Nahaga-mura, Minamitsugaru-gun, Aomori
3. Iwate	Morioka-shi, Iwate
4. Miyagi	Iwanuma-machi, Natori-gun, Miyagi
5. Akita	Akita-shi, Akita
6. Yamagata	Yamagata-shi, Yamagata
7. Fukushima	Tomita-mura, Asaka-gun, Fukushima
8. Ibaraki	Kamisomo-mura, Higashiibaraki-gun, Ibaraki
9. Tochigi	Utsunomiya-shi, Tochigi
10. Gumma	Maebashi-shi, Gumma
11. Saitama	Asao-machi, Kitaadachi-gun, Saitama
12. Chiba	Chiba-shi, Chiba
13. Tokyo	Tachikawa-shi, Tokyo
14. Kanagawa	Kamakura-shi, Kanagawa
15. Yamanashi	Kofu-shi, Yamanashi
16. Nagano	Nagano-shi, Nagano
17. Niigata	Nagaoka-shi, Niigata
18. Toyama	Toyama-shi, Toyama
19. Ishikawa	Kanazawa-shi, Ishikawa
20. Fukui	Fukui-shi, Fukui
21. Gifu	Nanasato-mura, Motosu-gun, Gifu
22. Shizuoka	Shizuoka-shi, Shizuoka
23. Aichi	Anjō-machi, Hekikai-gun, Aichi
24. Mie	Suzuka-shi, Mie
25. Shiga	Haruta-mura, Kurita-gun, Shiga
26. Kyoto	Kameoka-machi, Minamikuwada-gun, Kyoto
27. Osaka	Sakai-shi, Osaka
28. Nara	Unebi-machi, Takaichi-gun, Nara
29. Wakayama	Wakayama-shi, Wakayama
30. Hyogo	Akashi-shi, Hyogo
31. Tottori	Tottori-shi, Tottori
32. Shimane	Izumo-shi, Shimane
33. Okayama	Okayama-shi, Okayama
34. Hiroshima	Saijō-machi, Kamo-gun, Hiroshima
35. Yamaguchi	Ouchi-mura, Yoshiki-gun, Yamaguchi
36. Tokushima	Tokushima-shi, Tokushima
37. Kagawa	Busshozan-machi, Kagawa-gun, Kagawa
38. Ehime	Matsuyama-shi, Ehime
39. Kochi	Nagaoka-mura, Nagaoka-gun, Kochi
40. Fukuoka	Futsukaichi-machi, Tsukushi-gun, Fukuoka
41. Saga	Saga-shi, Saga
42. Nagasaki	Isahaya-shi, Nagasaki
43. Kumamoto	Kumamoto-shi, Kumamoto
44. Oita	Oita-shi, Oita
45. Miyazaki	Miyazaki-shi, Miyazaki
46. Kagoshima	Kagoshima-shi, Kagoshima

Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 17 (Cont'd)



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 17 A

into balls is also practiced. The heaving damage is believed to be lessened through the planting of several seeds in one hole.

Fertilizer furrows, according to Leonard, are made 24 to 28 inches apart, 3 inches deep, and 6 inches wide, and the fertilizers placed in the furrows are covered with 1 to 1.5 inches of soil; the rate of seeding for common barley varies from 48 to 68 pounds per acre and for naked barley from 50 to 74 pounds per acre; the seed is generally planted in the fertilized furrows in drills or bands about 4 inches wide; in areas subject to soil heaving, 50 to 60 seeds are planted per hill and the rows spaced 12 to 16 inches apart; in colder regions fall-sowing is made earlier in order that the plants be well established before cold weather sets in; dates of fall-sowing vary but throughout most of the country are generally between September 15 and November 30, while spring-planting in Hokkaido is usually from the end of April to early May. The actual dates of seeding and harvesting various grain crops are given for different regions of Japan in Table XII, and for each prefecture in Figures 11B, 11C, 11D and 16.

Transplanting of nursery-grown seedlings of winter cereals into drained paddy fields is occasionally practiced in some areas of Japan whenever the ripening of the rice crop is delayed to such an extent as to make direct seeding of winter grain too late and impracticable.

Tramping the soil as well as the very young seedlings almost as soon as they emerge to prevent damage from heaving soil, weeding and cultivating between rows of grain, and banking the plant rows with soil scooped from between rows to enrich the plant row with topsoil and fertilizer and to prevent lodging are among the standard cultural practices in growing cereals in Japan. Hand weeding and cultivating between rows of grain is usually performed several times during the season. The procedures of harvesting, drying, threshing, and cleaning wheat and barley are somewhat the same as those with rice. Common diseases and pests of wheat and barley in the various ecological regions of Japan are given in Tables XVI and XVII.

Except for small areas along the Japan Sea, barley is cultivated primarily in the Kanto district and southward, Leonard states. He adds that naked barley predominates mostly in areas with an average January temperature of 37.4° F. or higher in southwestern Japan, while common (covered) barley predominates in the areas of lower winter temperatures in central and northern Japan; and in Tohoku and in Hokkaido barley is grown as a spring crop in colder areas but as a winter crop wherever it can survive the winter climate, and it sometimes fails there because of injury by low winter temperature or by heavy snowcover. He further observes that there are many cultivated varieties of barley because of the country's diverse climatic and soil conditions and different cultural practices; that from 70 to 80 per cent of the barley acreage is planted to

varieties recommended by prefectural agricultural experiment stations (Figure 17); and that some of the barley varieties adapted to the various districts of the national agricultural experiment stations (Figure 17) are somewhat as follows:

District	Naked Barley Varieties	Covered Barley Varieties
Hokkaido	Marumi; Mitsukiku	
Tohoku	Tozan-Shirohadaka; Kezenhadaka	Iwate Menshuari No. 2; Miyagi Rokkaku No. 23; Miyagi No. 12; Hosomugi; Sekitori No. 3
Hokuriku		Omugi Sin No. 1; Kidaka Rokkaku
Kanto-Tosan	Zyoshu-Shirohadaka; Komehadaka; Onihadaka	Chikurin; Ibaragi No. 2; Tochigi Sekitori No. 1; Tochigi Golden Melon No. 1; Manriki; Sekitori Den No. 2; Sekitori Saitama No. 1; Bozu No. 1; Sekitori No. 2; Chikurin; Suisho Sekitori No. 305; Bizen-Wase
Tokai-Kinki	Kobinkatagi; Kagawa; Shirochinko; Yanehadaka; Kokubi; Akashinriki; Hakuma; Kairyo; Wasehadaka; Bozu	Tanikaze No. 105; Kuromugo No. 148; Shizuoka Shirorokkaku No. 1; Tanikaze No. 2; Yokozuna; Baitori No. 10; Shiga Hachikoku No. 5; Wase Golden Melon
Chugoku-Shikoku	Kobinkatagi; Kosaba; Shiroto; Yahazu; Shirochinko; Yanehadaka; Kobin; Henro; Nihon-ichi; Wasehadaka; Oishi	Hachikoku No. 2; Baitori No. 11; Benkai No. 3; Hakata No. 2
Kyushu	Takeshita; Shinriki-hadaka; Shimaoka; Kobinkatagi; Shimabara; Oitahadaka; Kobin; Negi; Kamaore; Kairyo-hizahachi	

Oats, rye, upland rice, millet, buckwheat and corn are among minor grain crops in Japan. Their importance varies with locality and some of them are of major importance in certain regions.

Oats do fairly well in cool, wet, foggy areas on acid soils, peat-bog soils, and volcanic soils none too suitable for other cereals. Cultivation of this crop is largely concentrated in Hokkaido, where over 95 per cent of the country's total acreage under oats is found. Oats, in 1950, occupied about 259,800 acres in Japan. This crop is sown in spring; in order to get better yields the land is usually plowed in the preceding autumn as soon after the harvest of summer crops as possible. In spring, the soil is pulverized, leveled, ridged, and planted to oats. While the planting practices with oats are more or less similar to those with barley and wheat, oats are planted a little earlier because of their somewhat longer growing period. The planting of oats in Hokkaido usually takes place as soon as

snow melting is ended, which is usually between late April and late May. Tillering season ranges from June to July. Though the heading dates vary with variety and planting season, the average heading dates in Hokkaido are about mid-July for early varieties of oats, the end of July for medium varieties, and early August for late varieties. The maturity season of oats in Hokkaido varies too with the variety and planting season, but on the average it usually is about mid-August for early varieties, end of August for medium varieties, and early September for late varieties. Some acreage is devoted to oats in Kyushu mainly in Miyazaki and Kagoshima Prefectures, where this crop is usually sown between mid-November and mid-December. Small acreages are found in northeastern Honshu. Some of the main varieties in Hokkaido are: Victory No. 1; Belgian-oats No. 12; Grass-oats No. 1; White-one-side head (resistant to lodging and suitable for districts subject to dense fog); Early-oats No. 1; Early-oats No. 2; Chicago; Zenshin (resistant to lodging); and Shokan No. 1 (resistant to rust disease).

Rye does well in dry cool-summer areas of the country. It appears to be adapted to Hokkaido and Tohoku (northern Honshu) as well as to the mountainous districts of central and southern Japan. The main rye-producing prefectures of Japan are: Hokkaido, Aomori, Miyagi, Akita, Yamagata, Tochigi, Yamanashi, and Nagano. In Akita the rye crop is cultivated extensively on poor and sandy soils not suitable to either barley or wheat. Rye is usually sown directly on the field but occasionally, as is also the case with wheat and barley, when too-late seeding is anticipated, seedlings are produced in a nursery and transplanted to the field. The time of sowing rye in the field for grain production ranges throughout most of the country from early October to early November. In Hokkaido rye is sown from the middle to the end of September. Generally speaking, rye is commonly seeded about 10 days after the fall-sowing of wheat (Figure 11C). There is no spring sowing of rye in Japan. The tillering season of rye ranges from the end of November to March. Heading is usually later than in wheat and, in northern Honshu, heading occurs between early and mid-June. Though late sowing delays somewhat the heading stage, the delay is slight and the difference in heading time is very small. Climate and varieties used are factors as to time of maturity of rye, but the crop usually requires about 40 days from heading to ripening. Accordingly, approximately mid-June to the end of July is the ripening season of rye in northern Honshu. In this region the rye crop is cultivated three times during the season: during the last two weeks of November, in early to mid-April and in early May. The moulding of soil (banking the plant row) is done during the last cultivation. Tramping of soil and young plants twice in autumn and once in spring when the soil has had a chance to dry after the snow-melting season, is a common practice with rye, the objective of which is to encourage sound growth and

prevent lodging, to which rye appears to be more susceptible than wheat. In addition to a considerable number of native varieties of rye known usually by the name of the geographical area where grown, the German rye Petkuser is very popular and its yields appear to be usually much higher than those of native varieties. This variety outyields wheat and so do many native varieties of rye under Hokkaido conditions and rye has been found to be more resistant to cold, to snowcover, and to snow blight than is wheat.

Upland rice is grown south of the 38th parallel, mainly, and most concentrated production is in the Kanto district and on the island of Kyushu. As upland rice depends on natural precipitation, it is grown in areas of high summer precipitation and on soils of high moisture-holding capacity. Areas of less than six inches average July precipitation are considered in Japan to be too dry for high yields of upland rice. Wherever showers occur frequently in summer and wherever there is more July precipitation, there is more land area under upland rice. Areas with July precipitation of less than six inches—considered to be a limiting factor for upland rice production—are shown in Figure 12. Japan's total upland rice production constitutes only about 2 per cent of the total paddy rice production, and the total land area under upland rice is less than 5 per cent of that under paddy rice. The yields of upland rice fluctuate from year to year much more than do those of paddy rice, as the latter does not depend on natural precipitation alone. Moreover, upland rice cannot be protected from the cool weather which frequently occurs during summer in northern and higher regions as can paddy rice, since irrigation water can be used as a means of protection against cold.

According to Leonard, preliminary cultural operations for upland rice depend upon the previous crop. When the rice crop is to be interplanted in winter-grown wheat or barley, shallow furrows are made between rows before sowing, and the furrows are fertilized, and then seed is sown. When upland rice is to be sown after wheat harvest, rows for the rice are made by digging up wheat stubble. Where there has been no previous crop, the field is spaded or plowed late in April or early in May, then harrowed and marked off into rows for planting by hand. With rows spaced 18 to 24 inches apart and hills in the row 3½ to 4½ inches apart, the amount of seed sown per acre is about 4.5 pounds for upland rice. Drill seeding is usually practiced with the depth of planting being from six- to eight-tenths of an inch. The sowing of upland rice in the Kanto district begins on bare fields about May 1, in fields between wheat rows from May 15 to 20, and in fields after wheat harvest during early June.

Harvesting time in the Kanto district is early September for early varieties of upland rice, September 15 to October 15 for medium varieties, and October 15 to the end of October for late varieties. Upland rice in Kyushu is usually sown in late May or in early June, and harvested as

follows: early varieties from late September to October 15, medium varieties from October 15 to 31, and late varieties from late October to November 15. The planting of early, mid-season, and late varieties of rice on paddies and on upland fields has a number of objectives, not the least of which is precaution against disaster. For example, if a typhoon hits at the blooming time it usually implies the end of the rice crop. Hence, many farmers plant early, mid-season and late varieties so as to have them come into bloom at different times as an additional precaution against complete loss of crops from typhoons. Upland rice fields are usually cultivated and weeded two or three times between June 15 and August 1, and the plants are thinned at the time of first cultivation, with some of the removed seedlings used as fillers in the poor stand areas. Harvesting, drying, threshing, dehulling, and cleaning of grain are the same as with paddy rice. Upland rice is usually grown only once in two years or more in the same field, as its yields decrease under continuous culture.

Common or nonglutinous types of upland rice varieties and chief regions of cultivation as stated by Leonard, include Urasan, Kurokan, Guderusgurazu, Norin No. 7 and Norin No. 12 in Kanto Plain area; Hakanmuri, Norin No. 11 and Upland Shinriki in Kyushu; Norin No. 12 west of Kanto; Fujioka-sen in Shizuoka Prefecture; and Tamasari No. 1 in northern Kanto and southern Tohoku. Glutinous types are represented by Norin glutinous No. 3, Musashi glutinous, Mino glutinous, and Kokko glutinous in Kanto; Norin glutinous No. 6, Kumamoto No. 1, and Dango glutinous in Kyushu; Norin glutinous No. 1 west of Kanto; and the Gaisen strain in the whole of Japan.

Millets constitute staple food in some areas of Japan. Foxtail millet, barnyard millet and proso millet are the three main types grown, and nation-wide acreages in 1950 were approximately 150,970 acres of foxtail millet, 72,695 of barnyard millet, and 55,965 of proso millet. The largest area of foxtail millet is in Kyushu, with the Kanto Plain area and Iwate and Aomori Prefectures of northern Honshu following. The largest acreage of barnyard millet is found in the northernmost parts of Honshu (Iwate and Aomori), with Hokkaido and central Honshu next in amount of acreage. Most of the acreage of proso millet is concentrated in Hokkaido, though a considerable acreage of this crop is also found in the Kanto area, in the Chugoku-Shikoku district and in Kyushu. Millet is grown largely as a summer crop on upland soils, though in southern Japan millet may be grown as an autumn crop in many places. Foxtail millet is the most popular of several millets grown in southwestern Honshu and Shikoku and is the millet generally grown on upland soils of poor fertility. It is often planted on the borders of vegetable plots, along roads and paths, and on dikes around rice fields. In Kyushu, where barnyard millet is the most popular, this crop is usually planted from early to mid-June and harvested from the middle to the end of October. Proso is the most

important of the millets of Hokkaido; foxtail and barnyard millets are grown to a lesser extent. In Hokkaido millets are sown usually from the third week of April to the second week of June, and are harvested from the second week of September to the third week of October. Barnyard and foxtail millets are the most common types grown in Iwate and Aomori Prefectures of Honshu, where the people often subsist on millet, as it takes the place of rice in their daily diet.

Buckwheat is usually the first crop grown on land cleared for cultivation and has the reputation of producing on soils poorly suited for other crops. It is an important crop in Hokkaido and in northern and central Honshu, as well as in certain areas of southern Japan. In the Kanto Plain buckwheat is commonly sown as a catch crop following early vegetables and preceding a winter grain. In some areas of southwestern Honshu buckwheat usually is the first crop sown on reclaimed land, and in Shikoku it is grown as an early fall crop or as the first crop on reclaimed land. In 1950 buckwheat occupied nearly 144,950 acres in Japan. This crop does best where mild and moist weather conditions prevail throughout its growing period. High temperature during the period of blooming or fruit setting often causes crop failure. During the early stages as well as during the ripening period, buckwheat is very sensitive to frost and is easily damaged. Varieties are classified in Japan as summer-type, fall-type, and intermediate-type. Summer buckwheat varieties are grown mainly in Hokkaido; fall varieties are found mostly throughout the rest of the country; and intermediate varieties are used throughout Japan. The differentiation between summer and fall types seems to be in a number of cases rather arbitrary, as frequently the same varieties of buckwheat are sown in the northern districts at different seasons of the year. A clearer differentiation between summer and fall varieties appears to be made in the southern districts where sowing time of each buckwheat type is somewhat more distinct. The above might be due to the fact that, though the summer-type varieties show a considerable decrease in yield if planted late, they seldom fail to produce at least some crop, which is not the case with fall types. The fall types if planted late often fail completely to produce any crop at all. Summer buckwheat is sown in the north as early as possible in the spring, and when there is no longer any danger of late spring frost. Generally, buckwheat must be sown at least 70 to 80 days prior to the first frost in the north and 80 to 90 days prior to first frost in the south. Because of its short growing period, this crop is frequently grown even in high latitude, altitude, and low temperature soil areas where other crops cannot be grown in Japan. Also, buckwheat seems to get along somehow in nearly sterile and very acid soils. It is periodically planted on the steeper slopes often far into the forest or brushwood or wasteland areas of the mountains where "temporary agriculture" is practiced. "Temporary agriculture" consists of clearing the

land through cutting or burning trees, brushwood, or wild grasses, and then either sowing grain in shallow furrows five to six inches wide and about two feet apart made among the burned stumps or merely broadcasting over the entire cleared area with no seedbed preparation of any kind. The seed is then covered lightly through the use of a kind of rake-like implement. After cropping such land for a few years, the farmer usually abandons it to natural vegetation for about ten years and then burns it over and crops it again for a few years.

Corn occupied in Japan in 1950 a total of about 147,865 acres. Hokkaido is the most important corn area, with the Kanto Plain, Shikoku and Kyushu next in order of importance. Many varieties of corn are used throughout the country and these vary from early to late ranging from 90-day corn varieties in the north to 180-day varieties in the south. For the purpose of selection of suitable varieties of corn, and corn crop improvement work throughout Japan, the country has been subdivided into four thermal belts or regions on the basis of mean temperature in the five months May through September. These subdivisions, as formulated by the Corn Breeding Section of the Nagano Agricultural Improvement Experiment Station, Ministry of Agriculture and Forestry, Japan, are as follows:

Corn Region	May-Through-September Mean Temperature	Agricultural District (Figure 17)
First Region	Under 63° F.	Hokkaido
Second Region	From 63° to 68° F.	Tohoku District, central part of Nagano Prefecture, and some areas of Gifu Prefecture.
Third Region	From 69° to 72° F.	Kanto-Tosan District, and Shimane and Tottori Prefectures of Chugoku-Shikoku District.
Fourth Region	Above 72° F.	Tokai-Kinki District (except Gifu Prefecture areas in the Second Region) and Shikoku and Kyushu Islands.

Among dent corn varieties recommended for each of these regions are:

First Region: Yellow Dent (early strains), Wisconsin Nos. 8 and 531, Mammoth White Dent, and Golden Glow.

Second Region: Nagano Nos. 1 and 4, Red Yellow Dent Northern, Lancaster Sure Crop, and Wisconsin No. 690.

Third Region: Yellow Dent (somewhat late strains), Nagano Nos. 3, 14, and 17, White Dent, and Yellow "Rimin."

Fourth Region: Yellow Dent (very late strains), White Dent (late strains), and Wood Golden Prolific.

Single-cross corn hybrids recommended for planting in the Second and Third Regions are Choko Nos. 30, 159, 161, and 202.

Dates of planting corn vary with the climate and the crop rotation pattern of a given locality. Generally speaking, however, the following dates are rather characteristic: Hokkaido, mid-May to end of May; Tohoku, mid-April to mid-May; Hokuriku, mid-April to end of April; Kanto-Tosan, mid-May to end of May; Tokai-Kinki, mid-May to end of May; Chugoku-Shikoku, early May to end of May; Kyushu, early May to mid-June.

Soybeans are grown throughout Japan and constitute the most important leguminous crop of the country. This staple food of the people of Japan is used extensively in making the highly popular soy paste or *miso* and in the brewing of soy sauce. The former, which is of much wider use than the soy sauce, is utilized in making soybean soup which is often served three times a day. Soy paste is also used as a butter-like spread, as a dressing for raw vegetables, and as a seasoning for cooked food. After the beans are harvested the plants are returned to the land for soil improvement, are used in the making of compost or are fed to animals. In 1950 the soybean crop of Japan covered over 749,675 acres. The Japanese classify their soybean varieties as early, medium, and late on the basis of maturity dates. Soybeans are also referred to as spring-sown or "summer-type" varieties, summer-sown or "fall-type" varieties, and intermediate or "neutral-type" varieties. The "summer-type" when planted in spring grow normally, flower, and yield well; when planted late in summer, the change from vegetative stage to reproductive stage is very rapid and the yield is poor. The "fall-type" varieties grow normally and produce well if planted in summer; early spring planting of these produces chiefly vegetative growth, bloom, but very little or no seed.

In Hokkaido, the largest soybean producing area of the country, summer-type varieties are used. Planting of summer-type soybeans in all areas of Japan may be as early in spring as the soil temperature reaches about 50° F.; in Hokkaido, as well as in northern Honshu, this is usually between mid-May and mid-June. Ripening time here ranges from early September to the end of October. In southern Japan summer-type varieties are planted from mid-April to mid-May, ripening in Kyushu about the second half of July, and fall-type varieties are planted mainly during July and mature usually in middle or late November.

The practice of growing soybean seedlings in a nursery and transplanting them early in April is often resorted to in order that the crop be harvested in late June or early July. This transplanting method is conducive to extension of the double-cropping system of field management somewhat farther north, as it eliminates about three weeks of the time the soybean crop would have occupied the field.

Soybeans are usually grown on upland fields of rolling-to-steep relief. They are often interplanted between rows of the winter crop a few weeks before its harvest or between rows of another summer crop. Sensitiveness

to different amounts of light varies with different varieties of soybeans; hence narrow, one-row alternate planting, for example with corn, is satisfactory only with the less shade-sensitive varieties of soybeans. Planting several rows of soybeans between rows of a tall-growing summer crop is the more common practice. Similarly, interplanting between winter-crop rows is delayed often as long as possible in order to reduce the length of time of adverse shading to a minimum. Soybeans are grown on most farms chiefly in single and double rows on dikes or levees or border strips between rice paddies. Soybeans are also frequently grown between rows of fruit trees or between mulberry shrubs. The usual cultural practice is to sow in rows and cultivate. Application of lime and some fertilizer is recommended.

Soybeans constitute also the principal summer green manure crop of Japan, while Chinese milk vetch (*Astragalus sinicus* Linn.) is the main winter green manure. A variety producing small beans, the so-called Hagawa soybean, is best for use as a green manure, according to Tanada and Swanson. They state that the seeds are planted from March to the end of May, with earlier planting in the south than in the north; that when used as green manure for rice, the soybean crop is usually plowed under in the spring about two weeks before rice is transplanted; and that when grown among mulberry or fruit trees soybeans are plowed under near the end of summer. Lists of common diseases and pests of soybeans in Japan are given in Tables XVI and XVII.

Other principal legumes grown in Japan are the summer-grown adzuki bean, a small red bean commonly planted as a border around vegetable gardens, and the winter-grown horse bean or broadbean. The latter is grown mainly during winter in the mild weather areas of the country on paddies or as an interplanted crop with barley, wheat, mulberry and fruit trees. It is planted on ridged paddies or on the less sloping upland soils in late fall. On paddies the plants are cut for green feed or used as compost because they do not mature before planting of rice seedlings. On uplands these beans are allowed to mature. On alluvial soils, where small grain is sown on wide beds, a common practice is to plant a row of the horse beans on the outer edges of beds. The beans are commonly grown as a border around small fields. When planted between rows of wheat or barley horse beans are usually harvested in April and May without hampering the growth of the wheat or barley. When interplanted between rows of fruit trees or mulberry shrubs the beans are harvested at the end of June. Horse beans are also used as a green manure crop in Japan.

Kidney beans, peas, and peanuts are other legumes used chiefly for food in Japan. Legumes used as green manure crops, in addition to the Chinese milk vetch, soybeans and horse beans, include common vetch, hairy vetch and yellow lupine.

Sweet potatoes constitute the most important vegetable upland crop throughout most of Japan except in Hokkaido and northern Honshu. They rank next to rice as a source of food for the country and produce a larger quantity of food per unit area than any other crop grown (Table VII), thus being highly valuable to a country where the areas of arable land are far less numerous than the hungry mouths to be fed. Repeatedly in the history of Japan the sweet potato has prevented widespread starvation during years of rice failure. It has enormous potentialities as a producer of food per acre, according to Boswell, yielding up to 50 per cent more calories on the less fertile uplands than rice does on the more fertile lowlands. It produces 2.5 times as much "rice equivalents" per acre as does barley, and 3.0 times as much as does wheat.

Nearly 80 per cent of the farmers grow sweet potatoes, which is indicative of the fact that climatic conditions prevailing over a large part of the country are favorable for this culture. In 1950 sweet potatoes occupied over 986,120 acres. The principal sweet potato districts are within the warmer regions of the country, Kyushu, Chugoku-Shikoku, Tokai-Kinki, and Kanto-Tosan (Figure 17) where much of the crop is cultivated on upland areas of loam- to sandy-loam soils and where the frost-free season consists of 200 days or more. The northern limit of sweet potato growing in Japan is approximately along the 40th parallel (Figure 3), though the principal production areas lie south of the 37th parallel. The time of field planting of sweet potatoes varies with variety, climate, soil and harvesting of winter grain. It ranges from early April to late July (Figure 11E). Most of the transplanting of sweet potatoes is done during the beginning of the summer rainy season, which lasts from mid-June to mid-July, and the ample rain helps greatly in the rapid establishment of a good stand of transplants in the field. Most of the harvesting of the sweet potato crop is done between mid-September and the end of October (Figure 11E), though the actual time of digging varies with the locality, variety, and use to which the sweet potato crop is to be put. Potatoes harvested for immediate family consumption or for any other immediate needs are usually dug when they reach sufficient size, irrespective of maturity or season. However, the bulk of the crop is allowed to mature before digging. The average date of the first killing frost of a given locality is a decisive factor as to harvest time because an effort is made to have the whole crop dug before that date. Sweet potatoes fit in well as a summer crop in rotation with wheat, barley, and other upland winter crops. Culbertson states that a survey made in 1945 in the Chugoku-Shikoku district showed that an average of 82 per cent of all crops preceding sweet potatoes and 78 per cent of crops following sweet potatoes were wheat or barley, that most farmers follow a crop sequence of sweet potatoes and winter grain year after year, and that upland rice, peanuts, or lupines are only occasionally and to a limited extent alternated with sweet potatoes.

He adds that heavy applications of compost and commercial fertilizers are required to maintain high crop production, and that the crop sequences followed as well as the prevailing practice of turning under sweet potato vines and their use in making compost are all conducive to black rot and other diseases. Principal diseases and pests of sweet potatoes in Japan are listed in Tables XVI and XVII.

Reported yields of Japan's sweet potatoes per unit area of land (Table VII) averaged in 1950, according to Culbertson, 15.77 metric tons per hectare (over 255 bushels per acre) or nearly three times the average yield of sweet potatoes per acre in the United States. He further shows the high yields of sweet potatoes which can be obtained under intensive cultural methods by pointing out that the average yields in Japan since 1910 have been about 195 bushels per acre while the average yield in the United States is only slightly over 85 bushels per acre; that 8 Kagoshima farmers produced in 1948 the equivalent of 52.5 tons per hectare or about 852 bushels of sweet potatoes per acre; that a top yield of 75 tons per hectare or over 1,216 bushels per acre is reported from Shizuoka Prefecture.

An extensive breeding and selection program is maintained by agricultural experiment stations of Japan. As the sweet potato plant does not flower in the latitudes of Japan, flowering is induced by grafting the vine of the sweet potato (*Ipomoea batatas* Poir.) on the root stock of the moon flower (*Calonyction aculeatum* House, also known as *Ipomoea bonanox).* Most varieties of sweet potatoes are self-incompatible or self-sterile and there are a number of groups in which varieties are subject to cross-incompatability, that is, they are sterile in crossing within the group. Crossings of varieties belonging to different groups, however, are fertile. Culbertson states that while in 1940 only 7 per cent of the sweet potatoes grown in Japan were of the improved varieties, by 1948 these varieties occupied 83 per cent of the total sweet potato area; and that the most popular varieties of sweet potatoes in 1948 in order of their planted area were Gokoku, Okinawa No. 100, Taihaku, Norin No. 1, Norin No. 2, Gengi, Oiran, Norin No. 4, and the principal administrative regions (Figure 1) where grown were:

Gokoku in Tokai and Chugoku; Okinawa No. 100 in Kanto, Kyushu, Tokai, and Kinki; Taihaku in Kanto, Hokuriku, and Tohoku; Norin No. 1 in Kanto, Chubu (Tosan) and Tokai; Norin No. 2 in Kyushu, Shikoku, and Chugoku; Gengi in Kyushu, Kanto, and Shikoku; Oiran in Kanto, Kyushu, and Chubu (Tosan); and Norin No. 4 in Kanto and Chubu (Tosan).

White potatoes, though a comparatively new crop in Japan, occupied during 1950 a total area of about 494,200 acres. This is one of the five major food crops of the country, the other four being rice, wheat, barley, and sweet potatoes. Nearly one-third of the total white potato acreage is in Hokkaido, where the cool growing season and sufficient precipitation

are conducive to high yields. White potatoes are grown throughout the country during the cool moist season and, after Hokkaido, the most concentrated production of this crop is in the central Honshu region in Saitama, Fukushima, Ibaraki and Nagano Prefectures. Climatic conditions of Hokkaido and of the high plateaus of Honshu as well as comparatively low insect population appear to make these areas very favorable for potato seed production, and the relatively disease-free seed developed in Hokkaido has been instrumental in the increase of potato acreage throughout the country. Dates of planting and harvesting white potatoes (Figure 11F) permit the division of the country's crop into three distinct seasonal production areas, the early spring-crop area, the late summer-crop area, and the fall-crop area. The first includes the whole of Japan from the Kanto Plain south, where white potatoes are planted in February and harvested from May to July; the second area includes Hokkaido and the plateaus of Honshu, where white potatoes are planted in April and May and harvested in August and September; and the third area is confined chiefly to mild-winter parts of southernmost Japan (Okayama, Hiroshima and Nagasaki Prefectures) and to some extent also to a number of small islands or peninsulas in the Pacific Ocean or Inland Sea where the first killing frosts do not occur until after mid-December. The fall-crop area is usually planted in August, and harvested during the first two weeks of December. Though the fall-crop potato acreage constitutes only about 2 per cent of the total white potato acreage and though the yields of the fall crop per acre are often only about two-thirds those of the spring crop, this is, nonetheless, an important crop as the plants grow and develop well during the cool autumn and the fall crop provides a good source of seed for the large spring crop. According to Wheeler, about 23 per cent of the Hokkaido potato crop is produced for seed, and potato seed is also produced in a number of areas where two crops of white potatoes per year are produced—the first principally for food and the second largely for seed. The planting and harvesting periods in seed-potato-producing areas, as outlined by Wheeler, are given in Figure 11G.

Early maturity of the white potato is important, especially in the case of the paddy-planted potato, as it must be harvested in time for the rice crop to be planted. Usually, wherever paddy fields are used for white potatoes, these are planted in the drained or ridged paddies in March and harvested in June. In the uplands, where the bulk of the potatoes is produced, the relative importance of earliness of potatoes depends on the type of rotation used (Figure 16) and climatic conditions. Thus, in Hokkaido and in northern Honshu much of the rotation used consists of the growing of only one crop per year, whereas in areas of milder winter conditions there are often two or even three crops per year. Wheeler states that the introduction of the early-maturing Irish Cobbler made possible white potato spring-crop production on paddy and uplands

in southern Japan; that various methods of potato seed treatment to break the dormancy period and make possible early emergence and thus also early harvest have been studied in Japan; that green sprouting and starting of the seed pieces in sweet potato beds have proved to be the most satisfactory methods of breaking the dormancy period; and that ethylene chlorohydrin is sometimes used to hasten the breaking of the rest period in fall-grown potato seed.

In reviewing the species and varietal composition of Japan's white potatoes Wheeler finds that, in addition to *Solanum tuberosum*, the species most widely cultivated, the only other species of prominence is *S. demissum*, as it possesses a high degree of immunity to late blight and can be crossed easily with *S. tuberosum* in order to obtain new varieties resistant to late blight; that, in 1948, 87 per cent of the potatoes produced in Japan were of the leading early potato variety Irish Cobbler or Danshaku and the important late variety Benimaru; that other white potato varieties grown include Norin Nos. 1, 2 and 3, Kintoki, Kaniyoimo, and Early Rose; and that the Irish Cobbler is grown in Hokkaido largely for seed, which is shipped in the fall to the other three islands for planting of the early spring crop there. He further states that in white potato crop culture practices of Japan much of the seedbed preparation is done by hand or at best by a small plow pulled by one animal and hence able to make only a shallow furrow of about 3 to 5 inches; that it is difficult to turn over and plow under sod properly with such shallow plowing and hence the Japanese farmers prefer a clean culture field for potatoes even though such a field lacks organic matter needed for better yields; that furrows are made in properly prepared soil approximately 30 inches apart and 3 to 5 inches deep; that commercial fertilizers, compost, or stable manure are applied in the furrow and that then the seed pieces are dropped in by hand and covered to a depth of 2 or 3 inches. The practice of extensive ridging common in poorly drained paddies requires a wider spacing of rows than where level planting is practiced, and the higher the ridge the wider the spacing between rows. Usually all phosphate and potash and about two-thirds of the nitrogen are applied at planting time with the other one-third of the nitrogen side-dressed just before blooming time. Cultivation and hand-weeding in the potato patch, ridging and hilling—first ridging prior to blooming and second when potatoes are in full bloom—and spraying and dusting against pests and diseases are the major field activities until time for harvesting, when most of the potatoes are dug with a hand fork. Aphids and the 28-spotted lady beetle are Japan's major insect pests of the white potato, while mosaic and leaf roll virus diseases as well as late blight, black scurf, and ring rot are the major diseases. Common diseases and pests of the white potato of Japan are given in Tables XVI and XVII.

Vegetable crops are widely grown in Japan and, though the truck crop production is found mainly in close proximity to the larger cities, much vegetable growing is for the farmer's home use and for local markets. Interculture planting is the common practice on upland fields, where most of the vegetables are grown. In some warmer areas drained paddies also are utilized for production of winter-grown vegetables. Some of the major vegetables grown in Japan are listed in Table XIV. Ten vegetable crops other than sweet potatoes and white potatoes constitute about 85 per cent of the total vegetable tonnage of the country. These, in order of their relative magnitude of production, are: *daikon,* the usually fall-planted, large Japanese radish which, despite its low food value, is highly popular, as evidenced by the fact that it makes up more than a third of the total vegetable tonnage, yielding from 6 to 8 tons of roots per acre—it is eaten largely as a pickle, adding flavor to the food and relieving the monotony of the predominantly starchy diet of the people; dasheen or taro, a plant developing a large starchy tuber and yielding very great tonnage per unit area of land; eggplant, the varieties of which differ considerably from those of the United States; Chinese cabbage and other oriental forms of *Brassica;* common cabbage and other occidental forms of *Brassica;* onion, Welsh and common types; pumpkin and winter-type squash; cucumbers, varieties of which differ considerably from those of America. The remaining 15 per cent of the total vegetable tonnage is made up of a great many different crops which include: burdock, a root vegetable; *konnyaku,* a starchy root *(Amorphophalus konjac* K. Koch); green beans and peas; carrots; turnips; tomatoes, the varieties of which are quite unlike the American varieties; peppers; watermelons; oriental pickling melon and other melons; spinach; lettuce; lotus; bamboo shoots; and many other vegetables.

High temperatures and high humidity of the summer growing season of the greater part of the country are conducive to the development of many diseases of vegetable crops; hence, the breeding and selection of disease-resistant varieties and the perfecting of methods of disease control are among major objectives of the vegetable research agencies. Some of the basic projects emphasized by the Vegetable Section of the Agricultural Research Institute, Ministry of Agriculture and Forestry of Japan, are breeding for resistance to disease, seed production, and studies of adaptation throughout the land. The ascertaining of climatic areas most suitable for seed production of various vegetables is also among the major tasks of the Section. Thus, it was found that, though northern Kyushu is subject to a considerable amount of precipitation during the winter, the relatively dry spring season is suitable for vegetable seed production; hence, in November, after rice is harvested, cabbage is transplanted and, in spring when the weather is dry, cabbage seed is harvested. The same plan is carried out with a number of other crops, and northern Kyushu

supplies seed of various members of the Cruciferae family as well as of the onion to the rest of Japan. Since rain during blossoming time of onions prevents pollination, advantage is taken of conditions in some areas of high altitude where cool climate delays blooming of onions until after the rainy season. Thus, the cool, high areas of Nagano Prefecture in central Honshu provide a very stable source of onion seed. Cauliflower seed production presented a problem in Japan until it was found that the difficulty was due to cold damage, and that in areas where the January mean temperature is 43° F. or over and where the frost-free season is long enough, as for example in the Pacific coastal regions to the south, cauliflower seed production is successful.

Small vegetable gardens for home use are intensively cultivated, and an area of 200 to 250 square feet per person is considered sufficient to supply the required vegetables. From such a limited piece of land maximum and year-round production is essential, and often five crops per year are harvested from the same ridge or bed. This necessitates continuous cultivation, and intensive rotation, and an efficient combination of vegetables. Thus, in some parts of the Kanto Plain potatoes are planted in March with a catch-crop of small turnips alongside. The small turnips are harvested before May and the potato plants, which begin to require more space about that time, are left there to grow to their full size. Dasheen (taro), which is tolerant to shade during the early growing stages, is planted between the potatoes and left to spread over the whole bed after potatoes are harvested. During late October when dasheen is harvested, spinach is planted for spring use, with garden peas between rows. Similar combinations of other vegetables are widely used. Usually in the Kanto region vegetable planting is done according to the following general schedule: between late February and late March hardy vegetables such as white potatoes and small turnips; from mid-April to early May beans, pumpkins, cucumbers; from mid-May to mid-June dasheen, sweet potatoes, peanuts, and corn; from August to September *daikon*, turnips, cabbage, spinach, and other greens; and about October such crops as *kyona* (*Brassica japonica* Mak.), spinach, garden peas, and broad or horse beans.

The date of the last killing frost is more or less synonymous with the beginning of spring field planting of vegetable crops. Therefore, the time of spring planting is earlier in warm Kyushu and Shikoku and is progressively later farther north.

There appears to be very little difference in the phenological data of different Japanese varieties of cucumbers, tomatoes or eggplant from a given locality. However, with respect to cabbages and Chinese cabbages the intervarietal differences are quite great. Watermelons and pumpkins show some intervarietal differences, too. The average interval of time between sowing of seed in the nursery bed and field planting of seedlings of cucumbers, tomatoes, and eggplant throughout Japan is usually 60, 90,

and 120 days, respectively; the date of starting the nursery bed for each is, therefore, coordinated with transplanting dates in each locality.

The following average dates of field planting and harvesting of various vegetable crops, as recorded by agricultural experiment stations of Japan, may be of interest. Numbers in the table below refer to National Agricultural Experiment Station Districts (Figure 17) as follows: (1) Hokkaido, (2) Tohoku, (3) Kanto-Tosan, (4) Hokuriku, (5) Tokai-Kinki, (6) Chugoku-Shikoku, and (7) Kyushu.

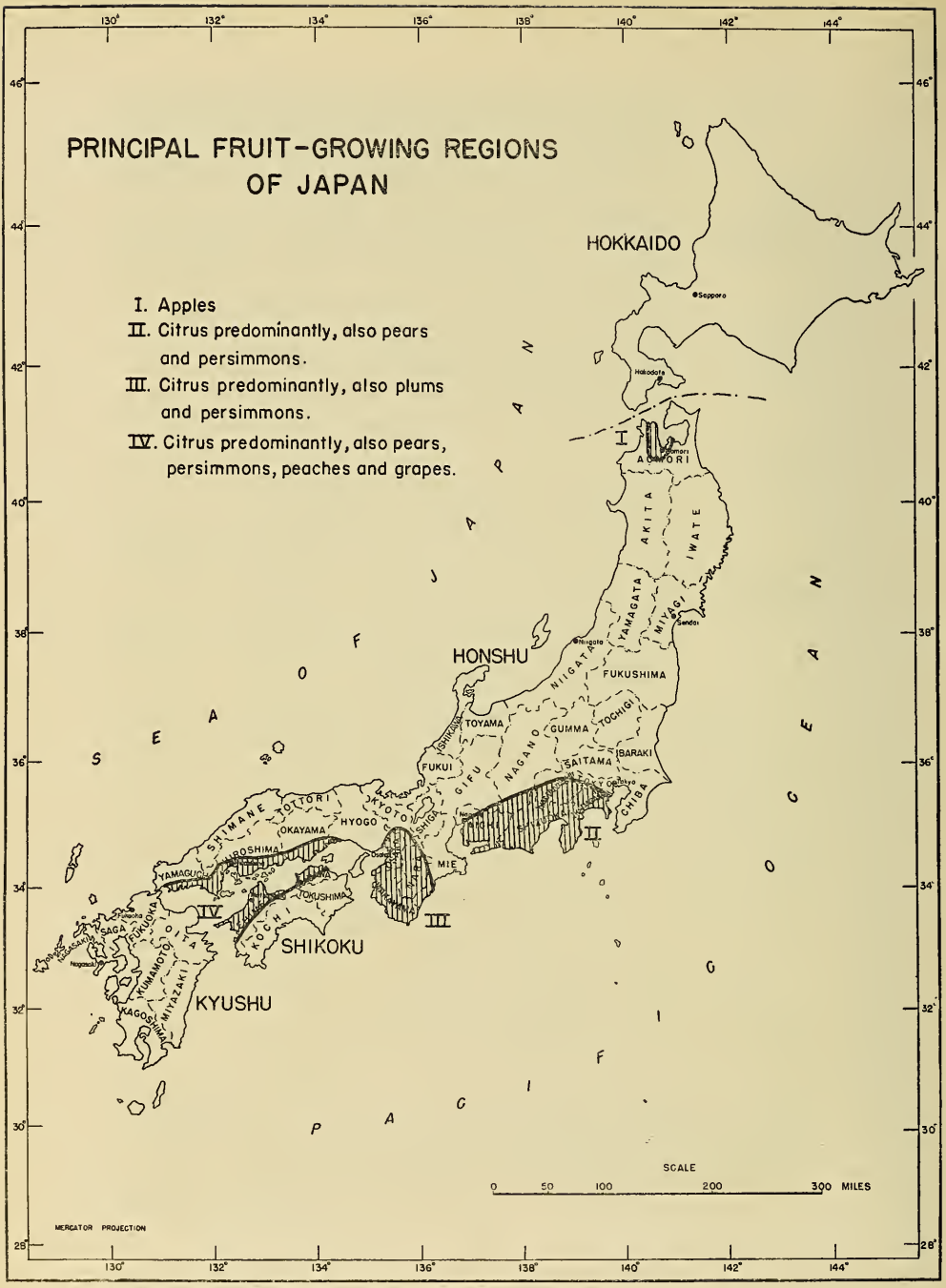
Cucumbers:	*Planting*—(1) early June, (2) mid-May to late May, (3) (6) late April to mid-May, (4) early May to mid-May, (5) late April to late May, (7) mid-April to late April. *Harvesting*—(1) early July to early September, (2) late June to early August, (3) early June to late August, (4) early June to early August, (5) mid-June to late August, (6) mid-May to late July, (7) mid-May to early July.
Tomatoes:	*Planting*—(1) (2) late May to early June, (3) (4) early May to mid-May, (5) late April to mid-May, (6) mid-April to mid-May, (7) mid-April to early May. *Harvesting*—(1) early August to mid-September, (2) early July to late September, (3) mid-June to early September, (4) late June to late August, (5) mid-June to late August, (6) (7) mid-June to mid-August.
Eggplant:	*Planting*—(1) (2) late May to early June, (3) (7) late April to mid-May (4) early May to mid-June, (5) (6) late April to late May. *Harvesting*—(1) (2) mid-July to early October, (3) mid-June to early October, (4) late June to early October, (5) late May to mid-October, (6) mid-June to late October, (7) mid-June to mid-September.
Cabbage:	*Planting (spring)*—(1) late May to early June, (2*) mid-June to early July, (3*) early March to early June, (4*) late June to early July. *Planting (fall)*—(2*) early October to mid-November, (3*) early November to mid-December, (4*) mid-November to early December, (5) mid-November to late February, (6) late November to late December, (7) early October to early December. *Harvesting (spring crop)*—(1) early October to late October, (2*) early August to mid-November, (3*) early June to mid-August, (4*) early October to late February. *Harvesting (fall crop)*—(2*) early June to late August, (3*) mid-May to late June, (4*) early June to mid-July, (5) mid-April to mid-July, (6) late May to late July, (7) early April to early June.
Chinese Cabbage:	*Planting*—(1) early July to mid-July, (2) late July to early August, (3) late July to late August, (4) (5) early August to early September, (6) (7) mid-August to early September. *Harvesting*—(1) early October to early November, (2) late September to late November, (3) mid-October to late November, (4) late October to late November, (5) late October to late January, (6) mid-October to late February, (7) early November to late January.
Spinach:	*Planting*—(1) late April, (2) late August to early October, (3) early September to late October, (4) late August to early September, (5) early September to mid-October, (6) early September to late November, (7) early September to early November. *Harvesting*—(1) early June to late June, (2) late October to mid-April, (3) late October to late March, (4) mid-October to late November, (5) (7) mid-October to late March, (6) late October to mid-March.
Welsh Onions: (Japanese Leeks)	*Planting*—(1) mid-August, (2) early July to early August, (3) late May to early August, (4) late July to mid-August, (5) mid-May to late August, (6) late June to early August, (7) mid-June to late July. *Harvesting*—(1) late July to late October, (2) (3) late October to late March, (4) mid-October to early March, (5) late September to late March, (6) late September to early April, (7) mid-October to late March.

* Two plantings per year.

Onions:	*Planting*—(1) late April, (2) early October to early November, (3) mid-October to late November, (4) early November to mid-November, (5) early November to late December, (6) mid-November to mid-December, (7) early December to late December. *Harvesting*—(1) early September to early October, (2) mid-June to mid-July, (3) (6) early June to mid-July, (4) mid-June to late June, (5) mid-May to late June, (7) early June to mid-June.
Daikon: (Japanese Radish)	*Planting*—(1) early August, (2) early August to mid-August, (3) (4) mid-August to early September, (5) mid-August to mid-September, (6) late August to mid-September, (7) early September to mid-September. *Harvesting*—(1) early October to mid-November, (2) mid-October to mid-November, (3) early November to mid-December, (4) mid-November to mid-December, (5) mid-October to late December, (6) mid-November to late January, (7) early November to early February.
Carrots:	*Planting*—(1) early May, (2) mid-June to late June, (3) (4) late June to early July, (5) late June to late July, (6) early July to early August, (7) mid-June to mid-July. *Harvesting*—(1) early September to late October, (2) mid-October to early November, (3) early October to late March, (4) mid-November to late November, (5) (7) late November to late March, (6) late October to late March.
Burdock:	*Planting*—(1) early May, (2) early April to late April, (3) mid-March to mid-May, (4) late March to mid-April, (5) (6) early March to late April, (7) late February to late March. *Harvesting*—(1) early October to mid-November, (2) early November to early December, (3) early October to late December, (4) early November to mid-December, (5) early November to late February, (6) early October to late February, (7) late October to early March.
Dasheen: (Taro)	*Planting*—(1) (2) early May to mid-May, (3) mid-April to mid-May, (4) mid-April to early May, (5) early April to early May, (6) late March to early May, (7) late March to late April. *Harvesting*—(1) (2) early September to early November, (3) early September to mid-November, (4) mid-August to mid-November, (5) early September to late November, (6) late August to early December, (7) mid-August to early March.

Fruit crops of Japan occupy more than 300,000 acres of land (Figure 10). A substantial part of the total fruit tonnage comes not from conventional orchards or groves but from individual fruit trees scattered in dooryards and along roads and field boundaries. Most of the fruit trees are grown on uplands; Satsuma oranges constitute nearly a third of the total fruit volume harvested in Japan. The principal fruit-growing regions of the country, according to 1946 data of Reif, are given in Figure 18. The eight major fruit cultures of Japan based on tonnage of fruit produced are Satsuma oranges, apples, persimmons, Japanese plums, Japanese pears, peaches, grapes, and loquats. Some of the other fruits are Chinese and common pears, cherries, apricots, figs, chestnuts, and walnuts.

The four highly developed fruit-growing areas of Japan include, in order of importance, the following: (1) the extensive apple district of the Iwaki River in Aomori Prefecture of northern Honshu; (2) the western part of the Kii Peninsula and the area about the eastern end of Osaka Bay, embracing parts of Wakayama, Nara, and Osaka Prefectures of southern Honshu, the principal fruits of which are Satsuma oranges, persimmons, and Japanese plums; (3) the central Honshu prefectures of Kanagawa, Yamanashi, Shizuoka, and Aichi, where Satsuma oranges predominate and persimmons and Japanese pears are grown extensively;



Source: Based on Data from Natural Resources Section GHQ SCAP Figure 18

(4) the Inland Sea region, comprised of parts of Yamaguchi, Hiroshima, Okayama, and Ehime Prefectures, the major fruits of which are Satsuma oranges, persimmons, pears, peaches, and grapes.

There are also the somewhat less concentrated yet rather important fruit-producing areas throughout Japan, and these include: (1) citrus-producing localities in the coastal regions of Kyushu; (2) the apple-growing areas of Hokkaido, Iwate, Yamagata, Akita, Fukushima, and Nagano Prefectures; (3) loquat-producing areas within the Satsuma orange belt with the heaviest production of loquats in Nagasaki, Kagoshima, and Ehime Prefectures. Japanese pears, peaches, and Japanese plums are grown widely. Except in Hokkaido, persimmons, too, are produced widely, the largest area being found in Fukushima, Nagano and Gifu. A detailed list of the varieties of major fruits of Japan and their distribution is given in Table XV.

On Hokkaido, apples and pears are the only fruits grown to any extent, with apples occupying an acreage over ten times that of pears. In northern Honshu, two-thirds of the fruit area is devoted to apples and this region produces the major part of the total apple tonnage; persimmons, pears, peaches, Japanese plums, loquats, grapes, and chestnuts are grown in varying amounts. In central Honshu, citrus fruits occupy the largest acreage, with persimmons and apples next; other fruits in order of importance are Japanese plums, grapes, pears, peaches, chestnuts, loquats, and walnuts. On the Japan Sea coast of central Honshu the relatively cold winters and heavy snowfall are limiting factors in the production of fruit; hence, fruit growing there is limited to relatively few persimmon trees, a few small, well-protected apple orchards, and some peaches and grapes grown on coastal sand dunes. On the Pacific side of central Honshu, especially in Shizuoka Prefecture, the high mountain ranges offer protection from the cold north winds and climatic conditions are favorable to fruit production. The relatively warm winters and long growing season permit the cultivation of citrus. Persimmons, loquats, Japanese plums, pears, peaches, apples, grapes, walnuts, and chestnuts are grown also on the Pacific coast of central Honshu. In southwestern Honshu, citrus plantings and persimmons, pears, peaches, loquats and grapes are of considerable importance. On Shikoku, the fruits include citrus, persimmons, pears, peaches, loquats, Japanese plums, apples, grapes, and chestnuts. Some olive plantings are found in Kagawa Prefecture on Shodoshima, an island in the Inland Sea. On Kyushu, citrus fruit, pears, peaches, loquats, grapes, and persimmons are produced in appreciable amounts.

Some of the yields of various fruit obtained in 1950 at the Tokai Horticultural Experiment Station may be of interest: 15-year-old Chinese pears growing 24 feet apart on trellises (pears are generally trained in Japan on low overhead trellises) produced 40,000 pounds per acre; Jap-

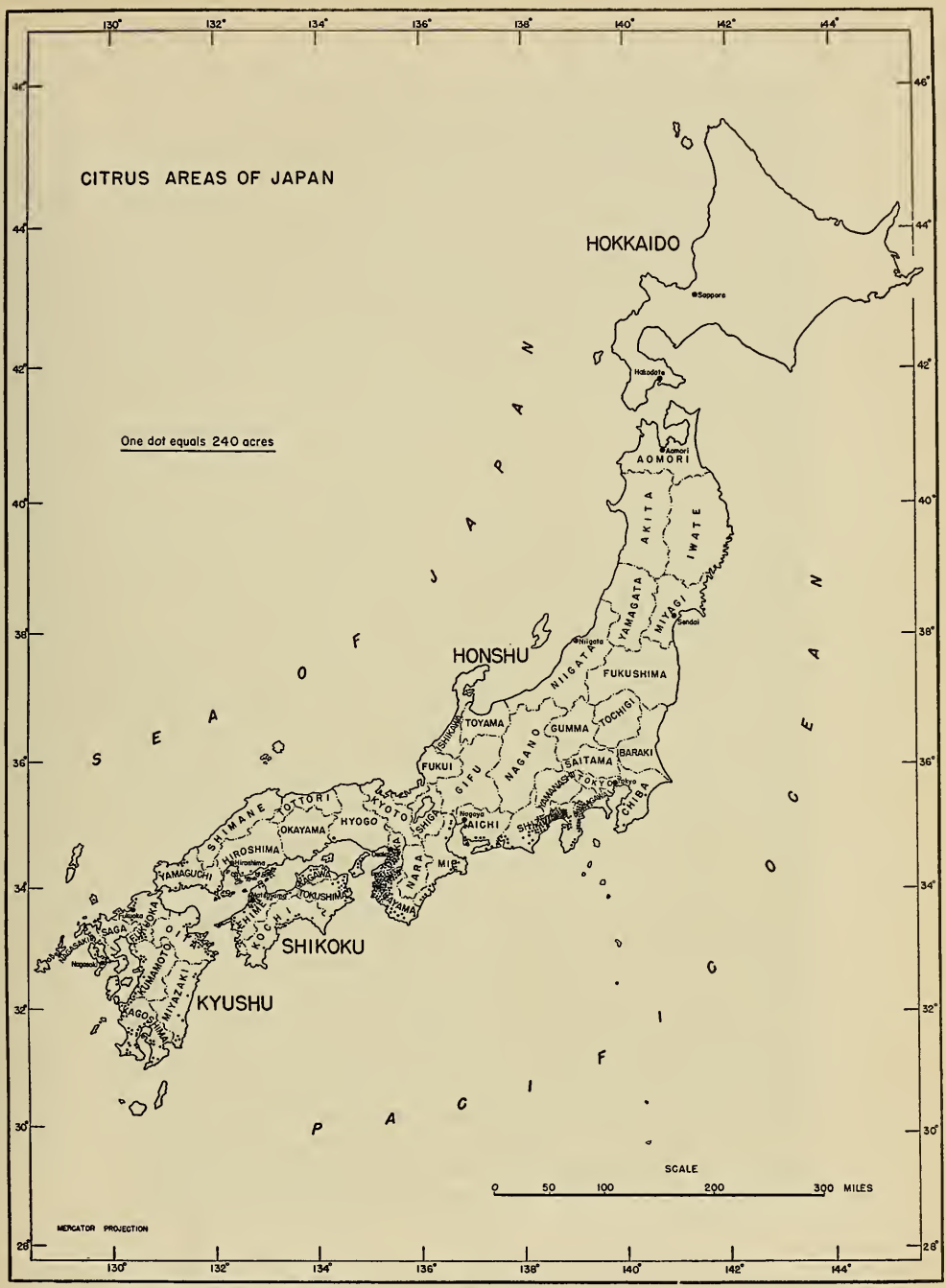
anese pear variety Chojuro, same age and spacing as above, 64,000 pounds per acre; Japanese pear variety Twentieth Century, same age and spacing as above, 48,000 pounds per acre; Fuyu, a persimmon, 20 years old, planted 30 feet apart, produced 22,400 pounds per acre; and a number of varieties of Satsuma orange, 40 years old, 18 feet apart, yielded an average of 64,000 pounds per acre.

The following average harvesting dates of various fruits in Japan, as supplied by agricultural experiment stations, may be of interest. Numbers in the table below refer to National Agricultural Experiment Station Districts (Figure 17) as follows: (1) Hokkaido, (2) Tohoku, (3) Kanto-Tosan, (4) Hokuriku, (5) Tokai-Kinki, (6) Chugoku-Shikoku, (7) Kyushu.

Satsuma Oranges (*Unshu*):	(3)(5) early October to late December, (6) late September to late December, (7) late September to early December.
Apples:	(1) mid-August to mid-October, (2) early August to late November, (3) late July to early November, (6) mid-July to late July.
Persimmons:	(2)(3) early October to early November, (4) early November to mid-November, (5)(6) late September to late November, (7) late September to early December.
Japanese Plums:	(1)(2)(4) late June, (3)(5) mid-June to late June, (6) early June to late June, (7) early June to mid-June.
Japanese Pears:	(1) early October to mid-October, (2) early September to early November, (3)(4) mid-August to early November, (5)(6)(7) early August to early November.
Peaches:	(2) late July to late September (3) early July to late August, (4) mid-July to late September, (5)(6) late June to late August, (7) late June to mid-August.
Grapes:	(1) early September to late October, (2) late August to early October, (3)(5)(6) early August to early November.
Loquats:	(2) early July, (3) mid-June to early July, (4) late June to early July, (5) early June to late June, (6) late May to late June, (7) mid-May to late June.

Citrus fruits provide about a third of the total fruit tonnage harvested in Japan. Citrus production is limited to the warmer areas of the southern half of the country (Figures 3 and 19) with only a few scattered Satsuma orange trees found north of the 35th parallel and these only in protected places. In 1950 the total land area under citrus in Japan was 107,570 acres, nearly 80 per cent of which (86,000 acres) was devoted to the Satsuma orange or *unshu* (*Citrus unshu* Marc.). The summer or bitter orange of Japan, called *natsudaidai*, (*Citrus natsudaidai* Hayata), the tartness and flavor of which make it resemble grapefruit more than orange, occupied 12,890 acres; navel orange plantings occupied about 1,850 acres; and other miscellaneous citrus plantings made up the remaining 6,800 acres.

The principal citrus-growing areas of Japan (Figure 19) are found along the southern coasts from Atami in Shizuoka Prefecture of southeastern Honshu to Kagoshima Prefecture in the southernmost part of Kyushu. In order of citrus fruit tonnage produced, the most important



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 19

citrus-growing prefectures are Shizuoka, Ehime, Wakayama, Kanagawa, Hiroshima, Kumamoto, Oita, and Yamaguchi.

The northernmost parts of Kanagawa and Shizuoka, though considered the marginal citrus area of Japan, are (especially Shizuoka) the major Satsuma orange regions of the country. The high mountain ranges of Shizuoka Prefecture offer a protection from cold north winds, and the climatic conditions, which are characterized by relatively warm winters and long growing seasons, permit a satisfactory citrus production. This is especially true on the protected hillsides near the coast where there is less danger of frost damage, and here most citrus plantings are found. Some of the citrus-planted hillsides are very steep, many having a slope gradient ranging from 60 to 80 per cent, and they are usually bench-terraced. Satsuma oranges are the major citrus species in Shizuoka, and plantings of Satsumas occupy nearly 90 per cent of the total citrus acreage of this region, the remaining acreage being under summer orange and a few navel orange trees. Only hillsides of good air-drainage are used for citrus-planting sites. It has been found here that, while citrus plantings on the lower and higher elevations are frequently damaged by frost, those in the central or middle strips of hillside plantings are usually relatively free from frost damage. Hence, the middle slope areas facing the ocean are considered the most desirable citrus-planting sites.

An interesting observation of the effect of elevation on temperature conditions in a Satsuma orange planting was reported last year by the Tokai Horticultural Experiment Station, Okitsu, Shizuoka Prefecture, where 80 per cent of the citrus orchards are planted on hillsides of considerable slope. At that station, thermometers are installed at elevation points of 20, 60, and 200 feet on a citrus-planted hillside. During December and January 1950-51 the lowest thermometer (40 feet below the site of the middle thermometer) is reported to have shown air temperature 3.6° F. lower than the middle thermometer showed, and soil temperature 21.6° F. lower, whereas the highest thermometer (140 feet above the middle thermometer) recorded air temperature 1.8° F. lower and soil temperature 8.6° F. lower than the middle thermometer. Generally, the mean January temperature of the northernmost commercial citrus regions of Japan is 40° or 41° F., and a temperature of under 25° F. is unusual. The average annual temperature of the citrus-growing regions of Japan is 59° or 60° F. and the minimum temperature is generally above 23° F.

There are a few areas of Shizuoka Prefecture where, though winter temperatures are favorable for citrus planting, wind and topography are limiting factors. Eastern and southern exposures are the most desirable citrus-planting sites in this prefecture. Citrus fruits planted on western exposures are subject to strong winter winds and must be protected by covering the tree in whole or in part with straw and straw-mattings. Sometimes the main branches of a tree are tied together as a protection

against cold winds. Winter damage to the Satsuma orange tree is seldom severe enough here to affect the wood and the damage appears to be confined to the leaves, which are occasionally winter-killed. Leaves on lower branches are the first to be injured and shed. Young Satsuma orange trees, however, are sometimes winter-killed too, yet soil banking is practiced only on a very limited scale.

North of Shizuoka most of the Satsuma orange production is found near Odawara on the Miura Peninsula in Kanagawa Prefecture and in the southern part of Chiba Prefecture. In the more southern and southwestern parts of Honshu, citrus plantings are found in coastal areas of Osaka Prefecture, around Wakayama in Wakayama Prefecture, along the Inland Sea in Hyogo and Okayama Prefectures, and in Hiroshima and Yamaguchi Prefectures. Citrus orchards here are found usually on protected hillside slopes near the coast where the warm ocean currents temper the climate in winter and lessen the chances of frost damage. In the areas along the Inland Sea the abundant sunshine and freedom from early and late freezing weather and from high winds are conducive to successful citrus production, though the hilly-to-steep, coarse-textured Lithosols on which most of the citrus orchards are planted here are very poor and must be heavily fertilized if good yields are to be obtained and the trees kept in good health.

On Shikoku the area in citrus fruits surpasses the combined area of all other fruits and more than one-half of the citrus production of the island is in Ehime Prefecture. Here, too, the citrus plantings are found usually on protected hillside slopes near the coast to lessen the chances of frost damage, and the soils must be heavily fertilized to maintain satisfactory yields.

On Kyushu citrus fruits are grown mainly in the southern areas. Kagoshima Prefecture leads, and citrus orchards are found also in Kumamoto, Nagasaki, and Oita. Citrus orchards of Kyushu are planted generally on protected hillsides near the coast. Though winter temperatures in some areas of southern Kyushu are considered mild enough to permit the growing of lemons and grapefruit, cultivation of these two fruits is hindered by citrus scab and canker and various other diseases which are prevalent under the high summer humidity and precipitation conditions. The quality of grapefruit grown in southern Kyushu and the Izu Peninsula in Shizuoka Prefecture is considered good. Poor quality lemons and some pummelos occasionally are found in citrus belt areas with the warmest winters. Save for a very few individual trees in highly protected areas, citrons and limes do not appear to be grown in Japan except under greenhouse conditions. In southern Kyushu and along the coasts of the Inland Sea some *ponkan* (*Citrus reticulata* Blanco) and *tankan* (*Citrus tankan* Hayata) are grown.

It should be pointed out that even in the warmest areas of the country nearly all of the citrus plantings are on protected hillsides near the coast

where the ocean currents temper the climate in winter and lessen the chances of frost damage; also, though orchards are usually planted on rolling or steep bench-terraced slopes, citrus plantings in Japan are seldom in areas over 400 feet in elevation. Moreover, at no point in Japan are citrus fruits grown more than 50 miles from the Pacific Ocean (Figure 19) and, since the effect of the ocean generally is to cause a rather uniform type of winter temperature without too much fluctuation, there is little damage to wood grown in such location.

The Satsuma orange or *unshu* of Japan consists of many varieties and strains which are roughly divided into late-maturing and early-maturing varieties, the latter called *Wase-unshu*. The late-maturing varieties, which make up the bulk of the Satsuma oranges of Japan, ripen between November and December; they consist of a number of types formerly known as Ikeda, Owari, Ikiriki, and Zairai strains of *unshu*. The present-day names of important late-maturing strains of the Satsuma orange and their main areas of distribution are as follows:

Prefecture	Varieties or Strains of Late-Maturing Unshu
Kanagawa	Tsujimura, Kashiwagi, Ishikawa, Sugiyama, and Iyoda
Shizuoka	Sugiyama and Ishikawa
Aichi	Oiwa No. 5
Mie	Atawa No. 16 and No. 36
Ehime	No. 4, No. 137, No. 11, and Ueda
Hiroshima	Onaga-zairai No. 1, Sugiyama, and Ehime No. 4
Oita	Mitsumata and No. 135
Nagasaki	Yamada, Ikiriki No. 36, and No. 43
Kumamoto	No. 1 and No. 2
Fukuoka	Ishikawa
Kagoshima	Iwamoto, Miyasako, and Kono

The early-maturing *unshu* or *wase-unshu* varieties ripen about one month earlier than the late-maturing *unshu* and can be harvested sometimes in early September. The early-maturing varieties are weaker than the late-maturing ones and their fruit splits easily. The most widely used early variety is Miyakawa Early; other early varieties of local importance include Kamei Early, Kato Early, Kawatsu Early, Ehime No. 20, and Kawano Early.

The Japanese summer orange or *natsudaidai*, which is next to *unshu* in acreage and fruit tonnage, requires 12 to 13 months to ripen and is harvested during April and May. Since it must winter-over on the tree, it requires warmer winter areas than does the Satsuma orange, the fruit of which is picked in fall. *Natsudaidai* varieties are produced in the vicinity of Hagi in Yamaguchi, in southwestern Ehime, in Hikada-gun[4] of Wakayama, and on the east coast of Izu Peninsula. Washington Navel orange occupies third place among the citrus crops of Japan, though its acreage is quite limited and it does not do too well throughout most of the country. Even in the Inland Sea area, winter weather is sometimes too cool and, to save the crops, this orange must be picked in December before

[4] *Gun*: county.

it is fully ripe; the same is sometimes the case in Kyushu, though there the fruit usually may be left on the tree until January. The high humidity of the country, also, is believed to be a contributing factor to the relatively poor quality of the local navel orange fruit.

Among other miscellaneous citrus fruits of Japan, some of which are of minor importance, there are, according to Dr. Y. Tanaka, Director of the Shizuoka Prefectural Citrus Experiment Station at Shumizu, the following: the Trovita, a sweet orange, which, he says, is a better sweet orange for Japan than is the navel orange; the Mizunawa, a sweet orange; the Tanitsu, a sweet orange, a strain of the Valencia of lower quality but more winter hardy than common Valencia; the *hasaku* orange (*Citrus hasaku* Y. Tanaka), a citrus hybrid of considerable promise believed to be hardy enough for the entire citrus-growing region of Japan with fruit which ripens in March and April, an orange which, though not as prolific as the major summer orange of the country, the *natsudaidai*, is more winter hardy; the *ponkan* tangerine (*Citrus reticulata* Blanco), which produces a sweet fruit somewhat inferior to that of the *unshu* and grows chiefly in Kagoshima Prefecture in Kyushu, where it ripens in January and February; *tankan* (*Citrus tankan* Hayata), a natural hybrid between the *ponkan* and a sweet orange, the fruit of which ripens during March and April; the pummelo (*Citrus grandis* Osbeck) grown as a special fruit in warmer areas of Kyushu in the prefectures of Nagasaki and Kagoshima; the *sanpokan* orange (*Citrus sulcata* Takahashi), a vigorous hybrid producing good quality fruit grown in Arita-gun and Kaito-gun of Wakayama; the *naruto* orange (*Citrus medioglobosa* Tanaka) an early summer orange grown in Tokushima Prefecture and on Awajishima, Hyogo Prefecture; the *iyo* orange (*Citrus iyo* Tanaka), widely grown in the Iyo region of Ehime Prefecture; and the *hynga* orange (*Citrus tamurana* Takahashi), a hybrid grown in Miyazaki Prefecture, the fruit of which is referred to as the new summer orange.

The most popular rootstocks for citrus in Japan are the trifoliate orange (*Poncirus trifoliata* Rafin.) and the *yuzu* orange (*Citrus junos* Tanaka). Plants budded on the *yuzu* are less hardy to cold in their young stage than those on the trifoliate. With age, however, they seem to become just as hardy or even hardier than those of trifoliate stock. *Yuzu*, having a deeper root system and being able to withstand drought better than the trifoliate, is now more highly recommended as a citrus stock in many parts of Japan though the farmers still use mainly the traditional trifoliate stock. The old tendency was to dwarf the trees in order to stimulate earlier bearing of citrus fruit; hence, trifoliate stock was used and the trees were pruned back heavily. The present tendency, according to Dr. Shoichi Tanaka, Director of Tokai Horticultural Station, is to encourage development of larger trees with a deeper root system which will stand drought better, even at the expense of later bearing. Hence, the present recommendation is either to use the *yuzu* as a rootstock or

to bud on trifoliate stock, keep it for about 10 years to get early production, then inarch a few seedlings of *yuzu* into the citrus tree on a trifoliate stock in order to get a healthier and larger tree.

Citrus research of Japan appears to deal principally with variety and strain testing, bud selection, rejuvenation by root inarching, pest and disease control methods, and some fertility and irrigation studies. Observations made at the irrigated plots at the Shizuoka Prefectural Citrus Experiment Station indicate strongly that irrigation during the drier summer months appears to be highly beneficial in the porous citrus soil areas of Japan despite the 80 inches of annual precipitation at the Station and the large annual precipitation throughout most of the citrus belt.

Apples make up about one-fifth of the total fruit tonnage of Japan. In area of cultivation, the apple crop is second only to the Satsuma orange crop, and in 1950 apples occupied about 84,000 acres. Of all commercial fruit crops of Japan, apples are grown in the coolest and driest upland areas. Aomori Prefecture produces about two-thirds of the total apple tonnage, and Hokkaido, Nagano, Akita, and Iwate grow some apples of rather good quality. Apple orchards are commonly interplanted up to about 10 years, then they are managed by clean-culture followed by a soybean green manure crop planted in July.

The main commercial varieties are: American or Early Summer Pearmain, McIntosh Red, Jonathan, Rall's Genet, Ben Davis, and Delicious. All of these varieties are cultivated throughout the northern parts of Japan, ranging from Hokkaido to Nagano and Yamanashi. However, Rall's Genet and Jonathan are the most popular varieties and occupy the greatest acreage. Some of the cool mountainous areas south of Nagano and Yamanashi are considered suitable for apple production, too. A few apple varieties bear rather well in warmer parts of the country, but the high summer temperature and humidity in those areas are frequently the cause of excessive disease damage and insect injury and the development of poor quality fruit. The total apple acreage in the warmer parts of Japan is relatively small. American Summer Pearmain is the variety cultivated in Kagawa Prefecture on Shikoku and in Saga and Kumamoto on Kyushu. Astrachan Red, though its fruit is of poorer quality, is grown to some extent, too, because of its early maturity and because it can be harvested from late June on. Dates of maturity and beginning-of-harvest of some apple varieties, though varying somewhat in different localities, average as follows: American or Early Summer Pearmain, from late August; McIntosh Red, from mid-September; Jonathan, from mid-October; Rall's Genet, from late October; and Delicious, late October.

To insure cross-pollination of self-incompatible apple varieties, hand-pollination is resorted to. It is one of the recommended orchard management practices of Japan. Varieties which blossom at about the same time are selected. The pollinating blossoms are carefully picked by hand and

placed on paper to dry for some time, and then these partially dried blossoms are shaken over blossoming apple trees of a self-incompatible variety. Pollen of one flower suffices to pollinate ten flowers; 500 to 1,000 flowers thus pollinated, per adult apple tree, is the recommended norm in order that the tendency toward alternate bearing and the cost of thinning of fruit be reduced. Fruit thinning generally is recommended to be carried out at an early stage, usually during early to mid-June, though the dates vary with variety and locality.

Thinning is done very thoroughly, and careful attention is given to the number of fruits to be left on each individual tree, to the number of young fruits on each spur or shoot-terminal of a given age (one fruit is to be left at an appropriate distance from another fruit), and also to the size and shape of the young fruit to be left.

Each individual fruit left after thinning is covered with a paper bag (usually waxed) to protect it from injurious insects—mainly the fruit borer. Though modern spray schedules are in use, the low-pressure spray equipment of the Japanese farmer does not seem to obtain a very satisfactory tree coverage. The number of fruits to be left and bagged per tree varies with variety and age of tree. In the case of the two most widely grown apple varieties in Japan, the recommended number of fruits to be left after thinning and to be bagged per tree is given below, as this is indicative of the labor-consuming task involved.

Age of Tree	Jonathan	Rall's Genet
Years	*Bags*	*Bags*
10	300	120
11	320	180
12	370	250
13	440	310
14	520	400
15	600	500
16	680	600
17	740	700
18	800	800
19	860	890
20	930	970
21	1,000	1,050
22	1,060	1,120

Jonathan is generally bagged from June 1 to 10 and Rall's Genet from June 15 to 25. Sometimes the practice is to change the bags from small or medium to larger ones as the fruit develops, but most commonly no changes are made and only large bags are used from the start. The fruit is generally covered and fastened in such a way as to leave the pedicel outside the bag. It is estimated that one man on the average can cover with paper bags about 2,000 fruits per 10-hour work day.

The date of removal of the paper bag depends on the date of maturity of a given variety in a given locality and on the color characteristics of the variety. The varieties which need no coloring may be harvested with the bags or harvested within a few days after the bags are removed.

Those, however, which have to color must be exposed to sun for various periods of time, and bags must be removed a few weeks prior to the date of maturity—in the case of Jonathan, for example, it is recommended that bags be removed from fruit at least 25 days prior to date of maturity, whereas in the case of Rall's Genet it is recommended that bags be removed at least 35 days prior to harvesting date. The removal of bags is done carefully, with both hands, lest fruit drop; the efficiency of workers in bag-removing is estimated to be more than double that in bagging. After the bags are removed the process of fruit coloring through exposure to sun often involves a considerable amount of careful work, too. For example, in order to get well-colored Jonathan and Rall's Genet apples it is recommended (1) that 10 days after paper bags have been removed the leaves and their petiols in close proximity or adjacent to the pedicels be removed; (2) that the fruit-bearing branches and fruit be turned toward the sun and, if possible, each branch fastened in the desired exposure position by tying to next nearest branch; (3) that after the fruit-bearing branches have been turned toward the sun for a few days or weeks they be allowed to assume their original drooping position; and (4) that the fruit be as free from touching any branches as possible and its position arranged accordingly. In harvesting the fruit great care is exercised not to damage it. Seaweeds and wood shavings are spread in the field hand baskets to prevent apples rolling and suffering mechanical injury.

Extensive studies on insect and disease control methods appear to be the major objectives of the horticultural stations working with apples. To some extent studies are also being conducted on varietal tests and various orchard management problems.

The Japanese persimmon (*Diospyros kaki* Thunb. var. *domestica* Mak.) occupied in 1949 an area of approximately 71,120 acres and contributed about a fifth of the total fruit tonnage of the country. It is the third most extensively grown fruit in Japan, following the Satsuma orange and apple. Most of the Japanese, it seems, would take persimmons in preference to apples or oranges or any other fruit were it not for the difference in prices. Japan has many varieties of the persimmon, and these are often of rather widely different characteristics. The two major groups of varieties are the non-astringent varieties and the highly astringent varieties. The fruit of the former may be divided into two subgroups, those referred to in Japan as "pollination constant" varieties and those referred to as "pollination variant" varieties. Pollination constant varieties are the "commercial-sweet" non-astringent persimmons, the fruit of which tastes sweet regardless of whether it was set parthenocarpically and is seedless (fruit of the Japanese persimmon has a strong tendency to parthenocarpic development) or was set through pollination and is seedy. Pollination variant varieties are the "home-garden" non-astringent

persimmons, the fruit of which tastes sweet only when it is seedy, and is astringent when without seed or with not enough seed. The two leading pollination constant non-astringent commercial varieties of Japan are Fuyu and Jiro; some of the other popular varieties of this group are Gosho, Hanagosho, Tenjingosho, and Fujiwaragosho. The main varieties of the pollination variant non-astringent home-garden types are Amashakume, Mizushima, Kyara, and Shogatsu.

Between 60 and 70 per cent of the commercial-sweet persimmons produced are of the Fuyu variety. Gosho varieties are excellent in quality but do not bear too well. The following outline of horticultural characteristics of some major non-astringent varieties of Japanese persimmons may be of interest:

Fuyu: *Growth form*—spreading, sturdy, diffuse branches. *Staminate flowers*—none. *Maturity*—early November. *Fruit*—large; pericarp smooth, deep orange-red, good lustre; flesh good quality, orange-yellow, thick, very sweet, non-astringent, few brown spots, few seeds. *Remarks*—very prolific, easy to grow, should be carefully trimmed, susceptible to anthracnose.

Jiro: *Growth form*—spreading, sturdy, branches dense. *Staminate flowers*—none. *Maturity*—late October to early November. *Fruit*—large; pericarp smooth, reddish-orange, medium lustre; flesh good quality, orange-yellow, thick, soft and juicy, very sweet, non-astringent, some brown spots, few seeds. *Remarks*—prolific, fruit tends to split.

Hanagosho: *Growth form*—rather erect, sturdy, branches rather dense. *Staminate flowers*—occasional. *Maturity*—mid-November. *Fruit*—large; pericarp smooth, orange-yellow, good lustre; flesh excellent quality, pale orange-yellow, thick, moderately sweet, somewhat astringent, very few brown spots, few seeds. *Remarks*—not prolific, late-maturing but sturdy, often has "empty" core.

Tenjingosho: *Growth form*—rather erect, weak, branches somewhat dense. *Staminate flowers*—rare. *Maturity*—late October. *Fruit*—large; pericarp rough, orange-vermilion, medium lustre; flesh medium-to-good quality, pale pink, thick, rather hard, moderately sweet, somewhat astringent, very few brown spots, few seeds. *Remarks*—prolific, fruit tends to split.

Fujiwaragosho: *Growth form*—spreading, sturdy, branches rather dense. *Staminate flowers*—occasional. *Maturity*—mid-November. *Fruit*—medium; pericarp smooth, deep orange-yellow, good lustre; flesh excellent quality, orange-red, soft, thick, very sweet, somewhat astringent, very few brown spots, few seeds. *Remarks*—not prolific, reaches maturity rather late.

Amashakume: *Growth form*—spreading, sturdy, branches dense. *Staminate flowers*—none. *Maturity*—mid-October to mid-November. *Fruit*—large; pericarp smooth, orange-yellow, lustre dull; flesh good quality, orange-yellow, soft, thick and juicy, very sweet, somewhat astringent, many brown spots, many seeds.

Mizushima: *Growth form*—spreading, sturdy, branches dense. *Staminate flowers*—none. *Maturity*—early October. *Fruit*—large; pericarp smooth, yellowish-red with medium lustre; flesh medium quality, orange, soft, very sweet, non-astringent, many brown spots, numerous seeds. *Remarks*—prolific, bears alternate years, promising for northern prefectures.

Kyara: *Growth form*—erect, sturdy, branches somewhat dense. *Staminate flowers*—occasional. *Maturity*—mid-October. *Fruit*—medium; pericarp rough, orange-yellow, medium lustre; flesh medium-to-good quality, color orange-yellow, thick, very sweet, many brown spots, many seeds. *Remarks*—Core rather large, flesh tough, prolific, but tends to remain astringent under too low temperature conditions.

Shogatsu: *Growth form*—spreading, sturdy, branches rather dense. *Staminate flowers*—usual. *Maturity*—late November. *Fruit*—large; pericarp smooth, orange-yellow, dull lustre; flesh medium quality, orange-yellow, thick, rather tough and not very juicy, very sweet, many brown spots, many seeds. *Remarks*—somewhat prolific, can be stored well, tends to remain astringent under too low temperature conditions.

Though the chilling requirement of the persimmon is relatively slight, the sweet persimmon appears to need some chilling as witnessed by the fact that it does not do well in warm-winter areas on Formosa, nor in some of the warmer areas of the Ryukyu Islands. Dr. M. Kajiura, Chief, Division of Horticulture, Agricultural Research Institute, Ministry of Agriculture and Forestry of Japan, has pointed out that production of good quality fruit of the Fuyu variety requires as high an air temperature during the growing season as that required by Satsuma oranges, though the winter temperatures can be much lower as the Japanese persimmons are moderately resistant to cold—much more resistant than are Satsuma oranges. The summer heat requirements of Fuyu for production of high quality fruit seem to indicate that in Japan the areas most suitable for this variety are those subject to an annual mean temperature of 60° F. or over, which suggests more or less that the northern boundary for Fuyu in Japan is somewhat the same as that for the Satsuma orange (Figure 3). Though this variety can be grown farther north, in Fukushima Prefecture, Kajiura says, the Fuyu fruit produced in Fukushima or in the northern Kanto region could never compete with the quality of that same variety produced in the warmer regions of Japan. Fuyu persimmons produced in Gifu Prefecture are considered of excellent quality and yet, in the opinion of Kajiura, even these are inferior both in taste and appearance to the fruit of this variety produced in other areas of more suitable thermal conditions. Hence, the trend in Japan is toward restricting cultivation of non-astringent persimmons to areas subject to natural growing conditions most favorable to production of high quality fruit. The fruit of some of the recently developed non-astringent varieties of Japan, it has been found, is of even better quality than that of Fuyu variety. Again, though the summer temperature requirements for production of a high quality persimmon are quite similar to summer temperature requirements for the Satsuma orange, the persimmon is in greater danger from too much summer rainfall and from typhoons than is the Satsuma orange. Therefore, the Satsuma orange areas of lesser summer precipitation and those somewhat sheltered from the adverse effects of typhoons are considered the most desirable Fuyu areas; these are found largely in the Inland Sea region and in the prefectures of Wakayama, Mie, Gifu, Aichi, and Shizuoka. Jiro, the second most important commercial non-astringent persimmon variety, has more or less the same climatic preferences as Fuyu.

Fruit of the highly astringent varieties of the persimmon is astringent until it becomes soft-ripe. Astringent varieties as a group appear to be

less particular than non-astringent types as to climate and they are adapted to a wider range of climatic conditions. The main astringent varieties of Japan are: Miyazaki and Tanenashi (the leading astringent variety of Florida) in southern Kyushu; Hagakure in northern Kyushu; Saijo and Gionbo in the Inland Sea region; Hachiya (leading astringent variety of California) in central Honshu; Yotsumizo in Shizuoka and Kanagawa Prefectures; Monpei in Hokuriku; Hiratanenashi in Niigata, Yamagata, and Nagano Prefectures; Emon in the Kanto Plain; and Aizumishirazu in Fukushima Prefecture.

Seedlings of *Diospyros lotus* Linn. are used as rootstock for astringent varieties in areas subject to cold climate. Otherwise the rootstocks used for Japanese persimmons are always seedlings of *Diospyros kaki* Thunb. Grafting in March is the generally accepted method of propagation of persimmons, and grafting is usually preferred in Japan to budding since it is easier and, it is said, gives a better stand. Budding is used only in emergencies, with the latest date for budding depending on locality, although in Kyushu budding may be done until the end of September. The Japanese persimmon tree is not attacked by many insect pests and does not seem to be injured even by the tree borer, which insect often severely harms apples, pears, peaches, citrus fruits, and figs.

The fruit of the astringent persimmons is used in Japan to make dried fruit or to make "sweetened" fruit. As most of the persimmons are harvested during the cool and rainy autumn months, the climatic conditions of many regions are none too suitable during that season for sun-drying persimmons, and artificial drying is costly; production of dried persimmons is therefore somewhat more profitable in areas subject to a drier and warmer autumn season. Some such areas where this industry is now concentrated are in Fukushima, Nagano, and Yamaguchi Prefectures. The areas for most economical production of the astringent persimmon varieties for making "sweetened" fruit seem to be, on the other hand, largely concentrated in close proximity to the consumption centers of the country.

It will be seen from the above that, as indicated by Kajiura, the trend in the distribution of persimmon acreage appears to be as follows: (1) commercial production of non-astringent varieties in areas climatically most conducive to the development of a high quality fruit; (2) commercial production of astringent varieties for dried-fruit purposes in areas climatically most suitable for economical drying of the fruit; and (3) commercial production of astringent varieties for "sweetened" fruit near local markets in order that the fruit be delivered and consumed without too much delay.

Japanese persimmons appear to comprise the most intensively and extensively studied fruit culture in Japan. Considerable attention has been given by the horticultural experiment stations to the handling and

processing of this fruit, to the causes of summer fruit drop that is characteristic of some varieties and also of some vigorously growing individual trees, to the propagation, planting, and pruning methods, and to the breeding and selection of new varieties.

Pears. The trees of the Japanese pear (*Pyrus pyrifolia*) require very little winter chilling, and can be grown in southern Japan, where the chief limiting factor is danger from typhoons. It is claimed that these pears can be kept without spoilage as long as 8 to 10 months after harvest. Varieties of Japanese pears now in use, according to Kajiura, may be divided roughly into two groups: Twentieth Century variety and the other varieties. The Twentieth Century is considered the Japanese pear of best quality. However, it has to be handled very carefully as the fruit is extremely tender (a triple paper bag is required as protection from insects and mechanical injuries), and it is very susceptible to black rot. Therefore, this pear is grown largely in areas least subject to black rot, that is, areas of minimum precipitation during April, May, and June, such as Tottori Prefecture in southwestern Honshu and the Ina region of Nagano Prefecture in central Honshu. The small amount of precipitation from April through June in these areas is favorable also to the development of fruit of better appearance. Other varieties of Japanese pears may be grown under relatively diverse climatic conditions, and much of the production is concentrated in areas in close proximity to various consumption centers. Japanese pears make up about 12 per cent of the total fruit tonnage of the country, and occupied in 1949 nearly 17,400 acres.

In addition to Japanese pears there are some common western pears (*Pyrus communis*) and Chinese pears (*Pyrus ussuriensis*) grown in Japan. Ori is so far the only Chinese pear grown to any extent in the country. The best quality fruit of the common pear is produced in Yamagata Prefecture of northern Honshu and in certain areas of Nagano Prefecture in central Honshu. Common pears produced in other areas of Japan are of inferior quality as a result of much hard, grit-cell tissue which often develops within the fruit, and which appears to be not unlike the "hard end" or "black end" of common pears grown in some Pacific areas of the United States where *Pyrus pyrifolia* seedlings were used as rootstock for common pears. The total area devoted to the common pear in Japan in 1949 was only about 1,400 acres.

Pear trees of Japan generally are topped and trained on horizontal overhead trellises five or six feet above the ground. The trellis system appears to make possible closer planting of pear trees and larger yields per unit area. It also makes harvesting easier, supports the branches and fruit, and serves as protection against winds. As soon as the fruit sets, each pear is enclosed in a paraffined paper bag for protection from insects, a practice conducive to production of high quality fruit. Protective bags of this kind often are similarly employed in various parts of Japan with

other fruits as well. Not only apples and pears but also peaches, loquats, and clusters of grapes may be enclosed in paper bags as soon as the fruit is set, for protection from insects (mainly fruit borers), even in cases when proper insecticides are applied through spraying and dusting. The improved quality, it is claimed, justifies the extra labor involved in covering each individual fruit with a protective bag.

Varieties of pears and comparisons of methods of training, pruning, and thinning have been given much attention by the horticultural experiment stations. Breeding work is conducted on a fairly large scale and some of the numerous recent hybrids of Twentieth Century crossed with sturdier and more disease-resistant varieties appear to be very promising. Main pear varieties grown in Japan are given in Table XV.

Plums in Japan consist of two groups. The first includes varieties of the mume plum (*Prunus mume* S. et Z.) which is also referred to as the Japanese apricot or *ume*. The fruit is used largely as a sour pickle, the *muboshi*, which will keep for several years. The second group consists of varieties of the *su-momo* or true Japanese plum (*Prunus salicina* Lindl.). Most of the varieties are clingstones, but there are some freestones too. Chief commercial varieties are Kelsey (Koshu-hatarikyo), Santa Rosa, Formosa, Beauty, and Sorudam. Good local varieties cultivated in some home gardens are Yonemomo, Mangaemon, and Terada.

Peaches are grown in Japan only to a limited extent, their area of cultivation in 1950 being approximately 11,400 acres, and their entire production amounting to only about 4 per cent of the total fruit tonnage. The major objective of research studies relative to peaches is the breeding and selection of varieties adapted to areas of excessive precipitation and high humidity conditions and resistant to the diseases prevalent in such areas, especially anthracnose. Some such varieties are said to have been developed recently, but production of peaches in a given region appears to be as yet largely inversely proportional to the amount of precipitation. The better peach areas are in Okayama Prefecture, and small acreages of peaches are scattered about the country. The earliest-maturing peaches are produced in warmer areas. Thus, in Kyushu peaches are harvested from late June to mid-August; in the Chugoku-Shikoku and the Tokai-Kinki districts (Figure 17) harvesting begins two to three weeks later; and in Tohoku the harvesting takes place from late July to late September. Peaches produced presently are grown only for fresh fruit markets, but American canning varieties are under study, and breeding work is in progress. Varieties of peaches of Japan are given in Table XV.

Grapes are grown in Japan in areas of lesser precipitation such as in Hokkaido, Yamagata, Fukushima, Yamanashi, Osaka, Hyogo, Okayama, and in the Inland Sea region. However, most of the grape-growing localities appear to have too much summer rainfall and humidity for successful cultivation of grape vines and a great many diseases are prevalent. Most

grapes grown are of the American species (*Vitis labrusca*), as the humidity and rainfall of the greater part of Japan appear to be excessively high for the cultivation of the European grape (*Vitis vinifera*). Moreover, in the northern regions of Japan winter temperatures are too low for the *vinifera*. However, Koshusanjaku and Koshu are two *viniferas* highly resistant to mildew and these are grown in some parts of Yamanashi, Osaka, and Okayama, although usually under glass. Two-thirds of such greenhouse grapes are produced in Okayama. Koshu varieties are considered to be oriental types of *Vitis vinifera* introduced from China. Major varieties of grapes grown in Japan are given in Table XV, though the list is limited, as viticultural studies and investigations in Japan appear to be extremely meager, possibly because of climatic limitations of the country and possibly also because of the loyalty of the people to the highly popular traditional Japanese rice-wine or *sake*, a common and tasty drink of low alcohol content. Some attention, however, is being given to viticulture, and limited breeding, pruning, training, and soil preparation studies are in progress. The 1949 area under grapevines in Japan was nearly 1,560 acres.

The loquat (*Eriobotrya japonica* Lindl.) is one of the important fruits of Japan. It is popular and a great deal of attention has been given to its improvement through cultivation, breeding and selection. The area devoted to loquats during 1950 was about 6,390 acres. Insofar as mature wood is concerned the loquat is considered hardier than the Satsuma orange, but the climatic requirements of the fruit are about the same as for the Satsuma orange. However, loquat trees usually begin to bloom in December and the fruit ripens in May, at the earliest, while the fruit of the Satsuma orange is generally picked in fall and is not endangered by low winter temperatures. As a temperature of only a few degrees below freezing may kill the flowers and damage or kill the young fruit, the loquat is climatically somewhat more restricted than the Satsuma orange despite its hardier wood tissues. The mild coastal areas in the south are considered the most suitable for production of fine quality loquats. Generally, however, at almost no point in Japan can one find commercial plantings of either the loquat or Satsuma orange at too great a distance from the Pacific Ocean where warm currents temper the winter climate and lessen the chances of frost damage.

The better commercial varieties of loquats in Japan are Tanaka, Mogi, and Kusunoki. Midzuko and Tsukumo are promising new varieties. Kusunoki produces highest quality fruit and is very sweet but shows little resistance to cold. More detailed descriptions follow:

Tanaka: Grown extensively in Chiba Prefecture. Tree erect and sturdy, blooming late December to late February, fruit maturing June 13 to 22. Resistant to cold, but appears susceptible to diseases and pests. Produces high yields of orange-yellow fruit, oval-spherical in shape, very tart and of medium sweetness, averaging 60 grams in weight. Stores well.

Mogi:	A popular variety in Kyushu for many years. Erect, sturdy tree, blooming early December to late February, fruit maturing approximately June 8 to 18. Weak in cold resistance, and susceptible to diseases and pests. Produces high yields of deep orange-yellow, oval-shaped, good quality fruit, moderately tart and of medium sweetness, averaging 50 grams in weight. Stores moderately well.
Tsukumo:	Developed from a cross of Mogi and Tanaka. Size and appearance of fruit very similar to Mogi, but fruit sweeter and less tart. Matures at same time as Mogi. Found to be more resistant to cold, diseases and pests than Mogi, produces higher yields, and stores better.
Midzuko:	Developed as a substitute for Tanaka by a cross of Tanaka and Kusunoki. Tree erect, less sturdy than Tanaka, blooming early December to late February, fruit maturing June 20 to 27. Weak in resistance to diseases and pests, but moderately cold-resistant. Produces high yields of good quality, flat-oval, orange-yellow fruit, moderately sweet, very tart, averaging 80 grams in weight. Stores well. Good for canning. Fruit shows green spots occasionally.

Tea—green tea—is a universal drink in Japan, and carefully cultivated small tea plantings are scattered throughout the upland areas south of the 37th parallel (Figure 3). In 1949 tea culture occupied nearly 66,100 acres, more than half of which were in Shizuoka Prefecture. Other prefectures leading in tea acreage are Kagoshima, Ibaraki, Mie, and Saitama. The common tea varieties of Japan belong to the species *Thea bohea*, and the tea plant, which is closely related to the ornamental camellia, is a subtropical, evergreen plant, which thrives in a humid climate and is easily injured by low temperature, and killed by prolonged exposure to temperatures below freezing. The major tea-producing areas of Japan are, therefore, found where the January mean is 40° F. or higher. Very little tea is planted in areas with a January mean of 35° F., or lower, though a few tea shrubs occasionally are found even as far north as Hokkaido. Except for Shizuoka Prefecture, where tea production is the major enterprise for many farmers, tea bushes are grown largely either as a secondary crop or as a row of windbreaks or ornamental plantings clipped for tea for home use. Most of the tea shrubs grown in Japan are highly heterogeneous seedlings. Disease-resistant, cold-resistant and high-yielding clones have been developed lately by tea experiment stations, and these vegetatively propagated, improved varieties are gradually becoming available to farmers. Methods of propagation, however, change slowly, as the tea plants are productive for 30 to 75 years and new plantings are infrequent. Tea can be propagated vegetatively by layering as well as by means of cuttings planted about a foot apart in rows 4.5 to 6 feet apart. Inter-cropping of the young plantation with cereals or vegetables is a common practice. The objective of pruning and training the tea plant is to develop a dense, semicircular bush about 3 feet high and 3 feet wide; at each harvest the bushes are clipped slightly to maintain an even growth; every few years the bushes are headed back to maintain the shape and size desired; rejuvenation by heavy cutting back to a height of about one foot is practiced in some regions at intervals of 5 to 30 years.

Heavy fertilization, cultivation, and disease and pest control are standard cultural practices on a tea plantation in Japan. The harvest consists of gathering terminal buds and the last three or four leaves of the twig; a number of pickings of tea leaves are made yearly; maximum production begins when the plant is 10 years old, but commercial production begins at 5 years, and some harvest is possible at 2 or 3 years. A detailed report by the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, on the tea culture in Japan was prepared in 1949 by Leonard and Roberts.

The silkworm mulberry is the only widespread industrial crop of Japan and the most important non-food upland culture of the country. It is grown largely on southern slopes and light soils from northern Honshu southward (Figure 3), particularly in the mountain basins, and produces best in areas of abundant sunshine and well-drained sandy loam or loam soils. In northernmost Honshu and farther north, winters are too cold, and mulberry plantings are relatively few. Mulberry production in Japan reached its maximum in 1930 when 1,748,350 acres were under mulberries. As a result of the last war, with the consequent loss of foreign silk markets and the need for increased food production much mulberry planting was uprooted and the 1949 mulberry area of Japan was only 457,670 acres. The tree is grown primarily for the leafy shoots fed to silkworms and, according to Daniels, Boulware, and Leonard, three mulberry species rather similar in appearance are utilized for that purpose. These are: *Morus bombycis* Koidz., the most cold-resistant mulberry, which buds early in spring, a number of varieties of which are grown in northern Honshu and in Hokkaido; *Morus alba* Linn., a number of varieties of which are adapted to warm regions and are grown largely from the Kanto Plain in central Honshu to Osaka Prefecture in southwestern Honshu; and *Morus multicaulis* Perr., the varieties of which are mid-season types adapted to dry, warm climates and grown west of Kyoto Prefecture in Honshu and on Shikoku and Kyushu.

The mulberry varieties are generally dioecious; there are, however, also mulberry trees or branches of trees (sports) which bear both kinds of flowers. Propagation of mulberries in Japan is largely through vegetative methods. Grafting is the most widely used method, but layering and propagation by means of cuttings are also common. Planting is done in late fall and early spring. The common method is to plant close in the row (1.5 to 4 feet apart) and allow greater distances between rows (4 to 11 feet) in order that inter-cropping be practiced. The maximum utilization of sunlight is the major consideration in deciding on the spacing of plants, direction of rows, and system of pruning or training. Systems employed in training the mulberry tree for most economical production of leaves vary, but the mulberry of Japan is predominantly trained as a bush-type, the leafy shoots being cut off each year at a height ranging

from less than 12 inches to over 35 inches from the surface of the ground. Heavy application of fertilizers and careful cultivation of the soil are required for maximum production of mulberry leaves, which are harvested in spring as soon as the early leaves reach maturity, continuing through midsummer to early fall. Use of disease-resistant varieties and disease and pest control systems is essential, as the mulberry is subject to a considerable number of diseases and pests.

Cultural practices of mulberry production in Japan as well as the rearing of silkworms and the production of raw silk are described in considerable detail in the 1947 report prepared by Daniels, Boulware, and Leonard for the Natural Resources Section. Salmon, in his paper on crop improvement in Japan, reviews the highlights of the highly profitable, improved methods of producing silk which were developed as a result of intensive research and which provide a most excellent example of coordinated scientific effort and a striking contribution to agricultural science. He states that, though between 1892 and 1942 mulberry acreage doubled, the production of cocoons increased nearly 5 times and of raw silk more than 10 times; and he records a 450 per cent increase of production of raw silk per acre of mulberries. The improved methods of silk production in Japan have been attained to a great extent through careful research on the mulberry and the silkworm. Breeding, selection, propagation, intensive orchard management, and disease and pest control of the mulberry have had their effects. Careful breeding and controlled mating of silkworms to produce vigorous, disease-resistant, and productive F_1 hybrid silkworms, the new methods of storing silkworm eggs, newly developed methods of treatment of eggs to permit hatching (which normally takes place only in spring) at any desired time during the year, and the great progress in prevention and control of silkworm diseases, all, have been among major contributing factors making possible the tremendous improvement of silk production in Japan.

TABLE VII
YIELDS OF MAJOR CROPS IN PREFECTURES OF JAPAN

PREFECTURES	PADDY RICE†			WHITE POTATOES			SWEET POTATOES		
	Average Yields* Per Acre	Yields per Acre for Some Recommended Varieties**		Average Yields* Per Acre	Yields per Acre for Some Recommended Varieties**		Average Yields* Per Acre	Yields per Acre for Some Recommended Varieties**	
	Bushels	Variety	Bushels	Bushels	Variety	Bushels	Bushels	Variety	Bushels
Hokkaido	80.75			226			184		
Aomori	88.65	Norin #1	89.51	194	Danshaku	290	146		
Iwate	79.96	Riku-u #132	82.05	155	Danshaku	197	180		
Miyagi	73.95	Aikoku #1	89.51	152	Norin #1	382	217	Okinawa #100	307
Akita	89.36	Riku-u #132	108.17	179	Danshaku	301	171		
Yamagata	90.11			167	Danshaku	169	180		
Fukushima	82.05	Aikoku #20	89.51	178	Danshaku	326	209	Okinawa #100	319
Ibaraki	67.58			155			292		
Tochigi	71.65	Norin #8	74.97	151	Danshaku	363	243		
Gumma	75.30	Asahi	113.01	179			269	Okinawa #100	475
Saitama	75.71			169			262		
Chiba	76.87			163			302		
Tokyo	65.12	Norin #8	78.32	171	Benimaru	281	285	Okinawa #100	307
Kanagawa	75.68	Norin #8	104.43	175			275	Taihaku	368
Niigata	82.69			157			224		
Toyama	73.48	Gimbozu	96.97	180	Benimaru	208	215	Okinawa #100	264
Ishikawa	72.95			191			197		
Fukui	69.22	Norin #6	108.16	156	Danshaku	197	180	Norin #13	215
Yamanashi	91.71	Norin #8	111.89	153	Danshaku	302	253	Norin #4	368
Nagano	93.32	Kameji	138.00	182	Benimaru	506	236	Norin #1	613
Gifu	73.81	Mino-sato	91.38	135			228	Okinawa #100	368
Shizuoka	83.88	Taisho-Akaho	89.51	133	Benimaru	169	297		
Aichi	83.81	Tokai-Asahi	96.97	118	Benimaru	253	286		
Mie	73.03	Asahi #1	93.24	142	Danshaku	225	243	Gokoku	331
Shiga	84.40	Shiga-Asahi	96.97	142			205	Gokoku	215
Kyoto	79.96	Shin-Asahi	117.11	156	Danshaku	309	239	Gokoku	276
Osaka	85.89	Osaka-Asahi #1	89.51	174			202	Gokoku	307
Hyogo	84.63	Asahi	93.24	161			201	Gokoku	307
Nara	85.30	Kairyo-Asahi	103.31	164	Benimaru	337	216	Gokoku	399
Wakayama	60.09	Asahi	111.89	142	Benimaru	169	223	Gokoku	245
Tottori	81.61			146			229		
Shimane	74.93	Aichi-Asahi	108.16	180			215	Gokoku	215
Okayama	83.10	Asahi	89.51	166			235		
Hiroshima	75.82			179	Benimaru	253	229	Kokei #4	245
Yamaguchi	73.66	Asahi #1	83.92	205			231	Gokoku	337
Tokushima	63.29	T.-Banto #1	93.24	178			233	Gokoku	368
Kagawa	82.61			179			266		
Ehime	75.90			170			247		
Kochi	53.41	Norin #6	74.59	132			227		
Fukuoka	90.52			185			241		
Saga	100.07			182			253	Norin #3	271
Nagasaki	76.20			172			280		
Kumamoto	88.69	Norin #18	100.70	196			276		
Oita	76.05			151			234		
Miyazaki	54.08	Zuiho	89.51	145			219	Norin #2	245
Kagoshima	63.89	Norin #18	96.97	146			254	Norin #2	491

* Based on data from Natural Resources Section, GHQ, SCAP, covering records for 1950.

** Based on data from Ministry of Agriculture and Forestry, Japan, covering records for last five years.

† Rice yields are given here for rough rice of paddy varieties. Some of the reported yields of a few of the recommended upland rice varieties according to the Ministry of Agriculture and Forestry are as follows: in Tochigi, Urasan #1, 28.35 bushels per acre: in Gumma, Norin #7, 95.85; in Tokyo, Norin #12, 74.59; in Kanagawa, Hozan, 67.13; in Shizuoka, Fujioka-sen #70, 44.76; in Mie, Norin #1, 55.95; in Hyogo, Norin #1, 44.76; in Ehime, Norin #16, 37.30; in Kumamoto, Tojima #1, 29.84; in Miyazaki, Hakanmuri, 52.22; in Kagoshima, Hakanmuri, 55.95.

TABLE VII—(Continued)
YIELDS OF MAJOR CROPS IN PREFECTURES OF JAPAN

PREFECTURES	WHEAT			NAKED BARLEY			BARLEY		
	Average Yields* Per Acre	Yields per Acre for Some Recommended Varieties**		Average Yields* Per Acre	Yields per Acre for Some Recommended Varieties**		Average Yields* Per Acre	Yields per Acre for Some Recommended Varieties**	
	Bushels	Variety	Bushels	Bushels	Variety	Bushels	Bushels	Variety	Bushels
Hokkaido	19.68			17.66			26.97		
Aomori	21.32			22.51			24.91		
Iwate	21.79	Norin #10	38.99	22.28			33.63	L.-Menshuari #1	61.15
Miyagi	25.53	Norin #33	34.88	27.42			39.72	Tozan #1	63.18
Akita	14.65	Furutsu	20.73	15.35			23.83	Omugi #4	54.01
Yamagata	26.02			30.69			39.91		
Fukushima ...	23.72	Norin #50	59.51	27.48			41.05	Sekitori #3	75.41
Ibaraki	25.55			26.72			41.09		
Tochigi	27.01			29.71			46.43		
Gumma	29.28	Norin #50	52.95	29.38			44.29	Manriki	73.78
Saitama	36.26			39.08			56.42		
Chiba	24.83			21.46			33.18		
Tokyo	27.48	Norin #50	38.99	24.82	Sobei	40.92	36.71	Okayama	50.96
Kanagawa	25.57	Norin #50	59.51	26.12			37.79	Takebayashi	59.92
Niigata	16.75			20.46			25.81		
Toyama	26.99	Norin #24	28.73	32.39			38.10	Aizu #2	40.76
Ishikawa	20.73			26.60			38.26		
Fukui	18.41	Norin #24	24.63	20.46			22.36	Kidakarokkaku	30.57
Yamanashi ...	28.81	Norin #50	61.36	29.36			38.54	Bizen-Wase	72.15
Nagano	30.64	Norin #39	77.98	36.49	Kaikei #46	69.57	52.42	Bizen-Wase	108.02
Gifu	21.67	Norin #26	32.84	26.97			32.73	Tanikaze #106	48.92
Shizuoka	22.76	Norin #26	24.63	21.46	Aka-Shinriki	26.60	25.84	Iwata-Santoku	28.53
Aichi	26.43	Norin #53	32.84	27.19			39.66	Yokozuna	55.03
Mie	20.91	Saitama #27	34.89	22.47	Kobinkatagi #36	38.88	23.79		
Shiga	26.82			26.58			32.69	Shigahakkoku #5	34.65
Kyoto	24.79	Norin #26	48.02	25.11	Kokubi #1	38.06	29.62	Dairokkaku #1	46.88
Osaka	25.37			28.29	Osakachinko #12	32.74	28.33		
Hyogo	27.77	Shinchucho	51.31	30.55	Aka-Shinriki	53.20	28.25		
Nara	31.13	Norin #26	38.58	30.45	Shikoku-mugi	41.74	30.57		
Wakayama ...	24.95	Norin #9	41.04	19.97	Shiro-chinko	30.69			
Tottori	25.20			25.05			30.43		
Shimane	23.35	Norin #25	45.76	27.95			34.57	Aizu #2	71.34
Okayama	31.77	Norin #52	41.04	31.47			41.33	Wase-Bozu	44.84
Hiroshima ...	30.95	Norin #4	34.89	31.04			34.81	Baitori	36.69
Yamaguchi ..	26.04			26.74	Hyogo-Hadaka	34.78	34.12		
Tokushima ..	26.82			26.87	T.-Shiromugi #8	45.01	23.79		
Kagawa	36.82			35.80					
Ehime	27.21	Ejima-Shinriki	27.09	29.16	Aichi #1	30.90	16.31		
Kochi	18.41	Norin #20	26.68	21.61	Aka-Shinriki	28.65	28.53		
Fukuoka	29.72			28.18			29.00		
Saga	27.68			26.78			30.37		
Nagasaki	26.21			25.33			26.03		
Kumamoto ...	26.02	Norin #20	28.73	28.20	Shimabara	28.65	29.76		
Oita	25.43			27.60			27.01		
Miyazaki	17.77	Norin #36	24.63	17.33	Nejire	24.55	25.15		
Kagoshima ...	13.73	Ejima-Shinriki	41.04	14.88	Kamaore #1	36.83	16.02		

NOTE: Pounds per bushel: rough rice, 45; white potatoes, 60; sweet potatoes, 55; wheat, 60; naked barley, 61; barley, 48. To convert to metric tons per hectare divide pounds per acre by 892.139.

* Based on data from Natural Resources Section, GHQ, SCAP, covering records for 1950.

** Based on data from Ministry of Agriculture and Forestry, Japan, covering records for past five years.

TABLE VIII

RELATIVE IMPORTANCE OF CROPS BY MAJOR GROUPS, 1947

CROP	AREA (1,000 ACRES)		PRODUCTION (1,000 TONS)	
Food crops				
Rice	7,293		10,011	
Other grains *	4,039		2,401	
Starch roots †	1,528		7,296	
Total grain and starch roots		12,860		19,708
Pulses and oil crops **	864		301	
Vegetables ††	884		5,069	
Fruits and nuts ***	314		733	
Sugar beets †††	42		137	
Total other food crops		2,104		6,240
TOTAL ALL FOOD CROPS		14,964		25,948
Other crops				
Textile fiber crops ****	115			
Silk mulberry	432			
Miscellaneous industrial crops ††††	223			
Green manure *****	1,166			
Total other crops		1,936		
TOTAL ALL CROPS		16,900		

Source: Based on Data from Natural Resources Section, GHQ, SCAP.

* Includes wheat, naked barley, barley, buckwheat, oats, corn, proso millet, foxtail millet, barnyard millet, sorghum.

† Includes sweet potatoes, white potatoes, "dasheen" (*Colocasia esculenta* Schott).

** Includes soybeans, red beans, broadbeans, kidney beans, peas, rapeseed, sesame, peanuts.

†† Includes "daikon" or Japanese radish (*Raphanus sativus* Linn. var. *acanthiformis* Mak.), eggplant, Chinese cabbage, watermelons, pumpkins, squash, tomatoes, turnips, carrots, cucumbers, dried onions, Welsh onions, spinach, head cabbage, burdock, immature broadbeans, immature kidney beans, immature peas, lotus, bamboo shoots.

*** Citrus fruits, persimmons, pears, peaches, apples, loquats, grapes, plums, chestnuts.

††† Although some sugar cane is grown in Japan, it has been omitted from this table. Sugar cane is a significant crop in Okinawa and the northern Ryukyus, but the amount grown within the present boundaries of Japan is very small.

**** Includes flax, cotton, ramie, hemp, jute.

†††† Including non-textile fibers. Includes "kozo" or Japanese paper mulberry (*Broussonetia kazinoki* Sieb.), "mitsumata" or paper bush (*Edgeworthia papyrifera* S. et Z.), "shichito-i" or mat grass (*Cyperus malaccensis* Lam.), "i" or mat rush (*Juncus effusus* Linn. var. *decipiens* Buch.), Chinese willow, tea, pyrethrum, tobacco, peppermint, "konnyaku" (*Amorphophalus konjac* K. Koch).

***** Includes "genge" or Chinese milk vetch (*Astragalus sinicus* Linn.), immature soybeans, other immature legumes.

TABLE IX
ACREAGE OF MAJOR CROPS OF JAPAN BY PREFECTURES
1950

PREFECTURE	RICE	WHITE POTATOES	SWEET POTATOES	WHEAT	NAKED BARLEY	BARLEY
	Acres	Acres	Acres	Acres	Acres	Acres
Hokkaido	355,003	186,497	98	73,530	46,667	62,672
Aomori	173,151	13,603	228	18,309	25	882
Iwate	155,761	7,794	1,397	33,039	1,667	33,799
Miyagi	255,958	12,233	5,368	22,476	1,152	50,295
Akita	255,051	5,375	735	1,716	10	159
Yamagata	240,590	7,189	4,167	13,701	294	8,186
Fukushima	241,571	14,071	11,740	40,932	1,642	65,221
Ibaraki	275,762	12,213	56,151	119,780	6,005	98,702
Tochigi	212,208	8,539	20,662	88,726	10,515	56,520
Gumma	124,584	8,753	24,093	112,967	8,260	53,554
Saitama	200,149	15,907	44,731	96,692	6,275	104,437
Chiba	269,635	6,196	67,672	84,363	5,490	61,569
Tokyo	32,059	5,789	16,642	22,574	4,142	29,608
Kanagawa	64,535	6,931	27,672	39,241	6,471	36,740
Niigata	434,366	12,897	17,353	13,971	1,078	8,382
Toyama	179,781	5,343	5,196	12,206	147	8,260
Ishikawa	124,749	5,005	8,848	7,525	25	13,358
Fukui	113,329	3,529	4,902	4,534	392	9,093
Yamanashi	44,853	5,711	7,500	35,858	1,127	27,084
Nagano	173,996	12,093	12,083	76,324	2,598	47,353
Gifu	156,594	7,049	17,182	41,422	10,711	43,530
Shizuoka	145,933	9,434	44,363	42,942	40,392	39,633
Aichi	218,874	11,498	56,324	102,893	42,304	40,147
Mie	169,560	4,150	26,373	33,064	64,045	12,476
Shiga	148,888	3,711	4,681	20,025	3,603	36,618
Kyoto	90,844	3,267	8,039	12,427	15,466	17,623
Osaka	79,133	7,289	6,029	9,338	39,388	5,343
Hyogo	219,127	6,110	10,760	34,510	96,692	9,142
Nara	69,535	3,772	6,838	14,878	36,814	25
Wakayama	67,464	2,272	13,775	13,530	34,437	
Tottori	79,118	2,843	8,677	14,446	13,897	7,353
Shimane	121,891	2,895	10,686	14,434	10,245	13,971
Okayama	198,654	4,892	16,054	71,226	58,383	17,745
Hiroshima	170,281	6,218	27,696	20,172	68,285	13,922
Yamaguchi	160,401	3,402	15,417	25,858	68,505	5,711
Tokushima	70,638	2,880	15,539	12,304	57,942	294
Kagawa	87,008	1,549	11,936	27,843	57,427	
Ehime	99,069	3,449	31,275	17,525	82,844	172
Kochi	87,086	1,074	26,152	12,794	36,937	147
Fukuoka	232,208	9,076	21,471	91,398	88,506	2,721
Saga	129,977	3,564	11,789	53,726	38,554	2,549
Nagasaki	77,059	4,846	56,250	23,971	73,873	1,593
Kumamoto	196,325	2,814	47,402	80,123	112,354	3,088
Oita	131,325	2,284	21,520	45,809	67,157	980
Miyazaki	132,624	3,054	41,569	45,834	53,677	2,304
Kagoshima	175,345	6,473	88,677	86,006	84,633	7,917

Source: Based on Data from Natural Resources Section, GHQ, SCAP.

TABLE X

AVERAGE TRANSPLANTING PERIODS OF RICE

(In Percentage)

PREFECTURE		MAY			JUNE			JULY			Area
		1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	
		%	%	%	%	%	%	%	%	%	%
Hokkaido	E.	4	32	58	6						49
	M.				69	31					39
	L.					77	23				12
	Total	2	16	28	30	21	3				100
Aomori	E.			21	76	3					5
	M.			25	75						48
	L.			26	74						47
	Total			25	75	0					100
Iwate	E.			3	70	27					9
	M.				50	50					49
	L.				45	54	1				42
	Total			0	50	50	0				100
Miyagi	E.		12	83	5						4
	M.		1	48	51						39
	L.			10	50	31	9				57
	Total		1	28	48	18	5				100
Akita	E.		1	3	32	46	18				8
	M.		1	4	58	27	10				77
	L.		2	6	71	21					15
	Total		1	5	58	27	9				100
Yamagata	E.			25	75						12
	M.			10	70	10	10				59
	L.			20	40	40					29
	Total			15	61	18	6				100
Fukushima	E.		10	50	34	6					24
	M.		1	18	33	35	13				48
	L.			1	17	41	30	10	1		28
	Total		2	21	29	31	14	3	0		100
Ibaraki	E.		3	16	46	27	7	1			18
	M.		1	4	21	47	23	4			48
	L.			3	15	42	32	7	1		34
	Total		1	6	23	43	23	4	0		100
Tochigi	E.			13	87						16
	M.				20	80					26
	L.					18	60	19	3		58
	Total			2	19	31	35	11	2		100
Gumma	E.				5	70	25				7
	M.					30	65	5			13
	L.					10	40	50			80
	Total				0	17	42	41			100
Saitama	E.		3	10	50	35	2				15
	M.			3	7	15	60	13	2		25
	L.			1	7	15	60	15	2		60
	Total		0	4	14	18	51	12	1		100
Chiba	E.		8	30	40	20	2				26
	M.			1	21	47	31				46
	L.				10	38	43	7	2		28
	Total		2	8	23	37	27	2	1		100
Tokyo	E.	1	1	2	64	28	4				4
	M.	1	1	1	26	38	29	4			24
	L.	1	1	13	30	39	15	1			72
	Total	1	1	10	31	38	18	1			100
Kanagawa	E.		1	6	16	47	27	3			14
	M.			2	10	35	48	5			60
	L.			2	8	35	46	8	1		26
	Total		0	3	10	37	45	5	0		100
Niigata	E.		2	35	55	7	1				41
	M.			20	58	20	2				48
	L.			17	60	22	1				11
	Total		1	25	58	15	1				100

E. M. L.—Early, Medium, Late Varieties.

TABLE X—(Continued)

AVERAGE TRANSPLANTING PERIODS OF RICE

(In Percentage)

PREFECTURE		MAY			JUNE			JULY			Area
		1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	
		%	%	%	%	%	%	%	%	%	%
Toyama	E.		13	56	26	5					15
	M.		5	54	34	7					58
	L.		2	38	44	16					27
	Total		6	49	36	9					100
Ishikawa	E.		26	74							39
	M.			44	56						36
	L.				48	40	8	4			25
	Total		10	45	32	10	2	1			100
Fukui	E.		6	38	40	11	5				29
	M.		4	30	35	18	10	3			34
	L.			20	36	23	14	5	2		37
	Total		3	28	37	18	10	3	1		100
Yamanashi	E.			1	13	47	29	10			26
	M.				4	11	63	21	1		23
	L.					19	54	23	4		51
	Total			0	4	25	49	20	2		100
Nagano	E.			10	70	20					25
	M.				20	40	20	15	5		55
	L.				15	30	40	10	5		20
	Total			2	32	33	19	10	4		100
Gifu	E.		2	6	25	38	22	7			15
	M.			1	13	34	41	11			41
	L.				4	18	54	22	2		44
	Total		0	1	11	28	44	15	1		100
Shizuoka	E.		1	2	13	44	40				13
	M.			1	4	28	62	5			52
	L.			1	1	15	78	5			35
	Total		0	0	5	26	64	5			100
Aichi	E.		3	18	19	22	31	7			4
	M.		1	3	5	11	44	35	1		13
	L.		1	6	5	10	42	33	3		83
	Total		1	6	6	10	42	32	3		100
Mie	E.		1	8	35	32	23	1			12
	M.			1	15	44	38	2			26
	L.				6	25	64	4	1		62
	Total		0	1	12	30	53	3	1		100
Shiga	E.			1	28	35	27	9			19
	M.			5	40	30	20	5			46
	L.				30	40	20	10			35
	Total			1	28	34	27	10			100
Kyoto	E.		2	6	19	38	33	2			24
	M.		3	10	10	36	39	2			39
	L.		1	2	8	36	50	3			37
	Total		1	7	12	36	42	2			100
Osaka	E.				30	50	20				3
	M.				10	80	10				7
	L.				2	23	75				90
	Total				4	27	69				100
Hyogo	E.			10	40	45	5				28
	M.				25	40	30	5			18
	L.					15	65	20			54
	Total			3	16	28	41	12			100
Nara	E.		1	9	33	51	6				16
	M.		2	7	28	54	9				26
	L.				9	35	52	4			58
	Total		1	4	17	42	33	3			100
Wakayama	E.		3	11	16	21	47	2			14
	M.			3	7	23	63	4			41
	L.			1	2	11	80	6			45
	Total		0	3	6	17	69	5			100
Tottori	E.			6	28	39	23	4			8
	M.			3	6	29	48	14			65
	L.			1	3	20	53	23			27
	Total			3	7	28	47	15			100

E. M. L.—Early, Medium, Late Varieties.

[*Continued next page*]

TABLE X—(Continued)

AVERAGE TRANSPLANTING PERIODS OF RICE

(In Percentage)

PREFECTURE		APRIL	MAY			JUNE			JULY			AUG.	
		21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	Area
		%	%	%	%	%	%	%	%	%	%	%	%
Shimane	E.			1	21	46	24	8					24
	M.				7	20	34	32	7				44
	L.				3	22	25	38	12				32
	Total			0	9	27	29	28	7				100
Okayama	E.			14	29	12	31	14					5
	M.			1	10	21	41	22	4	1			34
	L.					8	46	40	5	1			61
	Total			1	5	13	43	33	4	1			100
Hiroshima	E.				8	22	50	20					24
	M.					10	45	42	3				36
	L.						42	55	3				40
	Total				2	9	45	42	2				100
Yamaguchi	E.				43	57							14
	M.					10	50	40					52
	L.							54	46				34
	Total				6	13	26	39	16				100
Tokushima	E.			4	11	26	43	16					9
	M.			1	4	22	33	38	2				56
	L.			1	5	20	35	37	2				35
	Total			1	5	21	35	36	2				100
Kagawa	E.						20	80					1
	M.					1	2	74	23				10
	L.						2	71	25	2			89
	Total					0	2	72	24	2			100
Ehime	E.				13	20	47	20					6
	M.					5	10	75	10				67
	L.						9	78	13				27
	Total				2	5	15	68	10				100
Kochi	D.C.*												
1st Crop		50	50										5
S.C.**	E.		60	40									17
	M.			20	40	30	10						43
	L.						10	60	30				32
2nd Crop											40	60	3
	Total	2	13	16	17	13	7	19	10		1	2	100
Fukuoka	E.						5	80	15				5
	M.						6	74	20				16
	L.						4	57	38	1			79
	Total						4	61	34	1			100
Saga	E.			40	60								4
	M.				80	20							2
	L.				9	55	35	1					94
	Total			1	13	52	33	1					100
Nagasaki	E.						24	49	27				5
	M.						4	39	57				4
	L.						3	44	50	3			91
	Total						4	45	48	3			100
Kumamoto	E.			2	3	5	50	40					1
	L.				2	2	3	63	30				3
	M.					2	10	37	40	10			96
	Total			0	0	2	11	38	39	10			100
Oita	E.					43	43	14					7
	M.						40	50	10				10
	L.						7	62	24	7			83
	Total					3	13	57	21	6			100
Miyazaki	E.					7	26	60	7				7
	M.					3	16	57	24				8
	L.					1	7	59	33				85
	Total					1	10	59	30				100
Kagoshima	D.C.*												
1st Crop		1	73	26									4
S.C.**	E.						9	43	44	4			6
	M.						5	54	38	3			60
	L.						2	49	44	5			30
2nd Crop												100	0
	Total	0	3	1			4	50	39	3		0	100

Source: Based on Data from Ministry of Agriculture and Forestry, Japan.

E. M. L.—Early, Medium, Late Varieties. *D. C.—Double crop paddies. **S. C.—Single crop paddies.

TABLE XI

AVERAGE HARVESTING PERIODS OF RICE

(In Percentage)

PREFECTURE		JULY	AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER		Area
		21-31	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	
		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Hokkaido	E.					9	76	15									49
	M.							94	6								39
	L.								82	16	2						12
	Total					5	37	44	12	2	0						100
Aomori	E.						12	88									5
	M.							63	37								48
	L.							38	62								47
	Total						1	52	47								100
Iwate	E.						5	60	35								9
	M.							40	30	30							49
	L.								40	40	20						42
	Total						1	24	35	32	8						100
Miyagi	E.						94	6									4
	M.							99	1								39
	L.							72	14	12	2						57
	Total						4	80	8	7	1						100
Akita	E.					10	70	20									8
	M.						15	75	10								77
	L.							15	75	10							15
	Total					1	16	62	19	2							100
Yamagata	E.						50	50									12
	M.						15	60	25								59
	L.						10	60	30								29
	Total						18	58	24								100
Fukushima	E.							29	40	21	10						24
	M.								30	33	27	10					48
	L.								2	13	31	36	14	4			28
	Total							7	25	24	24	15	4	1			100
Ibaraki	E.				3	20	35	26	11	4	1						18
	M.					1	6	14	23	34	18	3	1				48
	L.							2	5	16	33	29	11	4			34
	Total				1	4	9	13	15	22	19	11	5	1			100
Tochigi	E.						13	25	38	24							16
	M.									19	81						26
	L.										47	33	20				58
	Total						2	4	6	9	48	19	12				100
Gumma	E.								15	65	20						7
	M.								20	50	30						13
	L.									5	65	30					80
	Total								4	15	57	24					100
Saitama	E.					15	50	35									15
	M.							5	25	60	10						25
	L.										55	40	5				60
	Total					2	8	6	6	15	36	24	3				100
Chiba	E.		1	2	11	35	32	4	2	1	2						26
	M.						7	20	29	23	21						46
	L.							1	5	19	39	22	12	2			28
	Total		0	2	3	9	11	10	16	17	22	6	3	1			100

E. M. L.—Early, Medium, Late Varieties.

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TABLE XI—(Continued)

AVERAGE HARVESTING PERIODS OF RICE

(In Percentage)

PREFECTURE		JULY	AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER		
		21-31	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	Area
		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Tokyo	E.					4	68	8	12	8							4
	M.						2	35	21	20	11	11					24
	L.							3	16	38	32	7	4				72
	Total					0	3	10	18	32	26	8	3				100
Kanagawa	E.						1	6	20	43	18	10	2				14
	M.								3	26	33	28	9	1			60
	L.									3	30	44	20	3			26
	Total						0	1	5	23	31	29	10	1			100
Niigata	E.				1	38	36	20	5								41
	M.					5	23	33	36	3							48
	L.					1	3	25	50	15	5	1					11
	Total				1	17	26	27	25	4	0	0					100
Toyama	E.				5	56	39										15
	M.						28	44	25	3							58
	L.								12	61	27						27
	Total				1	8	22	26	17	19	7						100
Ishikawa	E.				8	92											39
	M.						33	25	42								36
	L.									100							25
	Total				3	36	12	9	15	25							100
Fukui	E.					5	33	50	12								29
	M.						6	24	52	12	6						34
	L.								5	25	40	22	8				37
	Total					1	12	23	23	13	17	8	3				100
Yamanashi	E.								26	32	29	9	4				26
	M.									25	59	15	1				23
	L.									2	11	48	30	9			51
	Total								7	15	28	29	16	5			100
Nagano	E.							20	40	30	10						25
	M.								10	40	30	20					55
	L.								5	30	40	20	5				20
	Total							5	17	36	26	15	1				100
Gifu	E.						1	19	26	28	18	6	2				15
	M.							5	9	29	30	20	6	1			41
	L.							1	1	6	15	32	31	14			44
	Total						0	5	8	19	22	23	16	7			100
Shizuoka	E.							10	14	40	27	8	1				13
	M.								4	12	33	39	10	2			52
	L.									1	4	25	45	21	4		35
	Total							1	4	12	22	31	21	8	1		100
Aichi	E.							5	12	33	36	13	1				4
	M.								2	11	32	39	13	3			13
	L.									1	16	25	39	17	2		83
	Total							0	0	4	19	27	34	14	2		100
Mie	E.						2	7	31	34	20	5	1				12
	M.								6	31	35	22	6				26
	L.										2	13	39	38	8		62
	Total						0	1	6	12	12	15	25	24	5		100

Shiga	E.		5	20	30	40	5						19
	M.					30	40	20	10				46
	L.					10	20	40	20	10			35
	Total		1	4	6	25	26	23	12	3			100
Kyoto	E.		2	11	46	23	13	5					24
	M.				7	46	33	8	5	1			39
	L.					4	25	12	46	11	1	1	37
	Total		1	3	14	24	21	13	19	4	1	0	100
Osaka	E.				45	55							3
	M.						60	40					7
	L.						5	25	50	20			90
	Total				1	2	8	26	45	18			100
Hyogo	E.				30	50	20						28
	M.						60	40					18
	L.						5	60	35				54
	Total				8	14	20	39	19				100
Nara	E.					44	56						16
	M.					5	95						26
	L.						26	74					58
	Total					8	49	43					100
Wakayama	E.		2	6	34	30	21	7					14
	M.				3	22	42	33					41
	L.						23	34	33	10			45
	Total		0	1	6	13	30	30	15	5			100
Tottori	E.			16	22	29	29	4					8
	M.			1	6	36	39	14	4				65
	L.				3	17	36	29	15				27
	Total			2	7	29	37	18	7				100
Shimane	E.		4	29	61	6							24
	M.				11	50	32	7					44
	L.					22	28	33	17				32
	Total		1	7	20	30	23	14	5				100
Okayama	E.			3	24	62	11						5
	M.				7	25	52	15	1				34
	L.					7	15	45	31	2			61
	Total			0	3	15	28	33	20	1			100
Hiroshima	E.			6	22	65	7						24
	M.				1	30	60	9					36
	L.						3	50	45	2			40
	Total			1	16	38	6	20	18	1			100
Yamaguchi	E.	9	15	35	30	11							14
	M.				11	45	34	10					52
	L.					15	36	38	11				34
	Total	1	2	5	27	25	17	19	4				100
Tokushima	E.			22	43	35							9
	M.				18	36	46						56
	L.						31	59	10				35
	Total			2	14	23	37	21	3				100
Kagawa	E.		100										1
	M.					70	30						10
	L.						75	25					89
	Total		1			7	70	22					100
Ehime	E.			5	15	80							6
	M.					29	71						67
	L.					3	59	38					27
	Total			0	1	25	64	10					100

E. M. L.—Early, Medium, Late Varieties.

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TABLE XI—(Continued)

AVERAGE HARVESTING PERIODS OF RICE

(In Percentage)

PREFECTURE	JULY	AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER		
	21-31	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	Area
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Kochi D.C.*																
1st Crop	80	20														5
S.C.** E.		20	70	10												17
M.					5	20	60	15								43
L.									20	60	20					32
2nd Crop											30	70				3
Total	4	4	12	2	2	9	26	6	6	19	8	2				100
Fukuoka E.								20	80							5
M.									35	55	10					16
L.										35	57	8				79
Total								1	10	37	46	6				100
Saga E.								20	80							4
M.									45	55						2
L.									8	60	30	2				94
Total								1	12	57	28	2				100
Nagasaki E.								44	56							5
M.									36	64						4
L.										30	70					91
Total								2	4	30	64					100
Kumamoto E.								10	70	20						1
M.								5	70	25						3
L.									5	65	30					96
Total								0	8	63	29					100
Oita E.								29	57	14						7
M.									20	60	20					10
L.									4	34	51	11				83
Total								2	9	35	45	9				100
Miyazaki E.								67	26	7						7
M.								13	62	25						8
L.								6	43	48	3					85
Total								11	44	43	2					100
Kagoshima D.C.*																
1st Crop		87	13													4
S.C.** E.								9	52	39						6
M.								3	33	59	5					60
L.								3	23	45	29					30
2nd Crop											100					0
Total		3	1					4	30	50	12					100

Source: Based on Data from Ministry of Agriculture and Forestry, Japan.

E. M. L.—Early, Medium, Late Varieties. *D. C.—Double crop paddies. **S. C.—Single crop paddies.

TABLE XII

AVERAGE PLANTING AND HARVESTING DATES OF STAPLE CROPS IN JAPAN

MAJOR GEOGRAPHICAL REGIONS	UPLAND RICE		PADDY RICE		WHITE POTATOES		SWEET POTATOES	
	Seeding	Harvesting	Transplanting	Harvesting	Planting	Harvesting	Transplanting	Harvesting
Hokkaido	.....	.....	*May 1- June 30	Sept. 1- Oct. 20	Apr. 10- June 10	Aug. 1- Oct. 20	.....	.....
Northern Honshu	.....	.....	May 1- July 10	Sept. 1- Nov. 30	Mar. 10- June 10	June 1- Oct. 10	May 10- July 20	Sept. 1- Nov. 20
Central Honshu								
Pacific Coast	May 10- May 25	Oct. 10- Oct. 25	June 10- June 25	Oct. 15- Nov. 10	Mar. 5- Mar. 25	June 15- June 30	May 15- June 15	Sept. 15- Oct. 30
Japan Sea Coast	May 5- May 15	Oct. 1- Oct. 10	May 15- June 10	Sept. 5- Oct. 20	Mar. 20- Apr. 10	June 20- July 15	May 25- June 15	Oct. 10- Oct. 30
Mountain Valleys	Apr. 20- May 15	Oct. 1- Oct. 30	June 10- June 30	Oct. 1- Oct. 30	Mar. 20- Apr. 10	July 10- July 30	May 20- June 15	Oct. 10- Oct. 30
Southwestern Honshu								
Eastern Half	.....	.....	May 10- July 10	Sept. 20- Nov. 30	Feb. 20- Apr. 20	May 20- July 20	May 10- July 10	Sept. 10- Nov. 30
Western Half	.....	.....	June 1- July 25	Sept. 1- Nov. 15	Feb. 25- Mar. 31 **Aug. 20- Sept. 10	May 25- June 15 Nov. 1- Nov. 30	May 20- June 15	Oct. 10- Nov. 1
Shikoku	.....	.....	***May 1- July 10	Aug. 1- Nov. 20	Feb. 1- Mar. 20	May 20- July 10	May 20- June 30	Sept. 20- Nov. 20
Kyushu	.....	.....	June 20- July 15	Nov. 1- Nov. 20	Feb. 15- Mar. 15 **Aug. 15- Sept. 15	June 1- June 30 Dec. 1- Dec. 20	May 15- June 15	Oct. 15- Nov. 10

* Approximately one-third of the rice in Hokkaido is sown directly in the field and the remainder is transplanted.

** Fall crop.

*** In Kochi Prefecture in the double crop rice paddy, first crop transplanted Apr. 20-May 10, harvested July 20-Aug. 10; second crop transplanted July 30-Aug. 10, harvested Nov. 1-20.

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TABLE XII—(Continued)

AVERAGE PLANTING AND HARVESTING DATES OF STAPLE CROPS IN JAPAN

MAJOR GEOGRAPHICAL REGIONS	WHEAT			NAKED BARLEY		BARLEY		SOYBEANS	
	Spring Planting	Fall Planting	Harvesting	Planting	Harvesting	Planting	Harvesting	Planting	Harvesting
Hokkaido	Apr. 20- May 31	Aug. 20- Oct. 10	July 20- Aug. 31	Apr. 20- May 31	July 1- Aug. 31	Apr. 20- May 31	July 1- Aug. 31	May 10- June 10	Sept. 10- Oct. 10
Northern Honshu	.....	Sept. 1- Nov. 30	June 10- July 31	Sept. 1- Nov. 30	June 1- July 31	Sept. 1- Dec. 10	June 1- Aug. 10	May 1- June 30	Aug. 20- Nov. 10
Central Honshu									
Pacific Coast	.....	Oct. 25- Nov. 15	May 25- June 15	.....	.....	Nov. 1- Nov. 20	May 25- June 10	June 1- June 30	Oct. 10- Nov. 15
Japan Sea Coast	.....	Sept. 25- Oct. 20	June 1- June 15	.....	.....	Sept. 25- Oct. 20	June 1- June 15	May 5- May 30	Sept. 15- Oct. 30
Mountain Valleys	.....	Oct. 10- Nov. 1	June 20- July 1	.....	.....	Sept. 30- Oct. 30	June 10- June 20	May 15- June 10	Oct. 10- Oct. 30
Southwestern Honshu									
Eastern Half	.....	Oct. 1- Dec. 10	May 20- June 30	Oct. 10- Dec. 10	May 20- June 30	Oct. 10- Nov. 30	May 10- June 30	.....	.....
Western Half	.....	Oct. 1- Dec. 15	June 1- June 30	.....	.....	Oct. 15- Dec. 1	May 15- June 15	Apr. 15- May 15 **June 1- July 1	Aug. 1- Aug. 31 Oct. 15- Nov. 15
Shikoku	.....	Oct. 20- Nov. 30	May 10- June 20	.....	.....	Oct. 20- Dec. 10	May 1- June 10	.....	.....
Kyushu	.....	Nov. 15- Dec. 15	June 1- June 20	.....	.....	Nov. 15- Dec. 15	June 1- June 20	Apr. 15- May 15 **July 1- July 15	Aug. 15- Sept. 15 Nov. 1- Nov. 15

Source: Based on Data from Natural Resources Section, GHQ, SCAP.

** Fall crop.

CONTROL OF DISEASES AND INSECT PESTS OF FARM CROPS OF JAPAN

Control of plant diseases and pests in Japan, as in other agricultural countries, is a highly important factor in crop production. Diseases and insects that affect Japanese agricultural crops are numerous and some of these have been listed in Tables XVI and XVII. Insect damage, according to the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, probably reduces potential food crop production in Japan an average of at least 7 per cent annually with present control measures. Damage caused by plant diseases as given in Figures 13B and 13C is believed to have been underestimated in Japanese data.

Christensen, in reviewing control of plant diseases, states that Japanese plant pathologists have developed methods of control for most of the major diseases and that, because of the small size of farms and extensive use of hand labor in farm operations, they are able to recommend methods of control that are not practicable in the United States. Thus, the spraying of cereals for rusts and foliage diseases is feasible in Japan but not economical in the United States. On the other hand, he points out, while certain soil-borne diseases are controlled in the United States through proper cropping sequence it would be neither economical nor practicable to control these diseases through similar methods in Japan. Though the use of fungicides for seed treatments is widespread in Japan, Christensen finds that the prevalence of certain seed-borne or soil-borne diseases which infect young seedlings indicates insufficient seed treatment with efficacious fungicides. He also finds that, though diseases like rusts and powdery mildew can be controlled or at least greatly reduced by judicious spraying and dusting with fungicides, this method in order to be effective requires the application of fungicides at the appropriate time and this is very often a difficult task in much of Japan, chiefly because of frequent rains during the growing season. This difficulty is possibly one of the chief reasons why spraying and dusting of cereals is not a general practice in many regions of Japan. He further states that a relatively large number of varieties of cereals have been tested in Japan for their disease reaction to the pathogens prevalent in a given area so that the identity of varieties resistant to one or more diseases is rather well known in Japan; that varieties now grown in many localities, although resistant to one pathogen, are frequently susceptible to another important pathogen; and that, although considerable progress has been made in Japan in developing disease-resistant varieties of cereals, there are still pending extensive crop breeding programs which attempt to incorporate into a desirable agronomic variety the resistance to all major diseases and to physiologic races within each species of causal organisms.

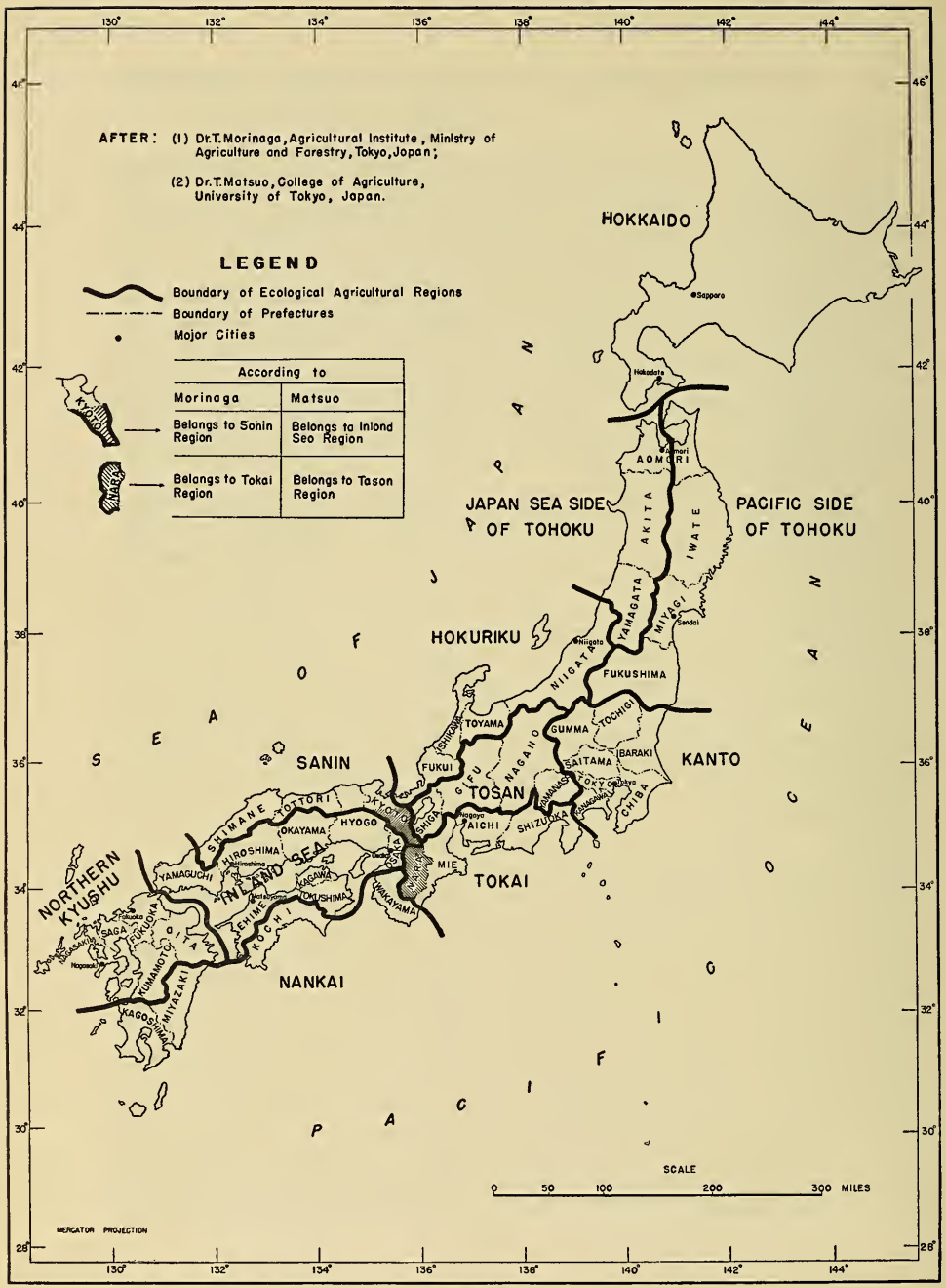
The study of plant pathogens and injurious insects and their control methods is among the major projects of the agricultural research agencies of Japan. Though insecticide dusts and oils and modern spray schedules are increasingly employed in Japanese insect control, some other methods of control also are in use in various areas. These include the following: hand-picking injurious insects from infested plants and destroying them; roguing out insect-infested plants; placing various types of light traps for moths, particularly the moth of the rice stem borer; sprinkling oil on water in rice paddies and beating rice plants with sticks, causing leafhoppers to jump from the plants into the oil film where they are killed; and paper-bagging individual fruits soon after setting (especially apples and pears) to control fruit borers. Though climatic conditions are conducive to disease development, several factors in the agricultural pattern of Japan mitigate against excessive losses from disease: the small agricultural valleys which are isolated from one another; the fact that areas in the same crop often are not contiguous, except for irrigated rice; and the careful and most thorough inspection given by the farmer to his little fields and orchards and his practice of destroying diseased plants or plant parts as soon as found.

GENETICO-ECOLOGICAL CLASSIFICATION OF CROP VARIETIES, AND A DESCRIPTION OF AGRO-ECOLOGICAL REGIONS OF JAPAN

Varying conditions associated with climate, soil, and distribution of plant pathogens and insect pests have been studied extensively in Japan in conjunction with the highly diverse agricultural practices and sequence of crops, and the seasonal farm labor situation of various parts of the country. An organized effort has been made by plant scientists of Japan to classify plant varieties on the basis of adaptation and suitability to the diverse physical and biological environments and land-use patterns. This is especially true of numerous varieties of rice, the classification of which as to suitability to various micro-climatic and farming areas has been given much attention by plant breeders and agronomists of Japan. These classifications based on genetic characteristics of plant varieties and their geoagronomic distribution are often referred to in Japan as the genetico-ecological classifications.

Dr. T. Matsuo of the College of Agriculture, University of Tokyo, formerly in charge of the Rice Section, Division of Research, Agricultural Improvement Bureau, Ministry of Agriculture and Forestry, Japan, in discussing the genetico-ecological classification of cultivated paddy rice, points out that a purely botanical or agronomical classification of the many rice varieties of Japan does not suffice, as such listing does not give any indication as to regional adaptation of a variety; that genetico-ecological classification does group within a species physiological types or varieties unified by certain genetic characteristics and especially adapted to certain ecological conditions; and that in like ecological areas varieties of like types are distributed, the tendency being for identical environments to be conducive to nearly identical varietal adaptation of a given plant species.

Classification according to physiological or ecological types involves detailed investigations as to effects on a given variety of climate, soil fertility, and plant pathogens and insect pests. These detailed investigations include studies of the effect of low temperature on germination of seed of a given variety, and studies of the optimum, minimum, and maximum day-length and temperature conditions during each distinct plant-growth period, especially with reference to effect of day-length and temperature on the reproductive growth stage. Matsuo suggests that, though in the case of rice long days as well as low temperatures generally retard heading, the degree of this effect appears to vary greatly with variety. This classification calls also for studies of the varietal reaction to soil fertility, especially to the nitrogen content of soil, as some rice varieties appear to have a high capacity for nitrogen absorption and assimilation and are able to increase greatly their yield of grain and to do well even in soil of very high nitrogen content, while other varieties



-Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 20

do not respond in yields to excessive nitrogen application and the excessive nitrogen causes softening of plant tissues and increases susceptibility to lodging and to the rice borer. Great attention is also given in this classification to studies dealing with the effect of the temperature of irrigation water on disease susceptibility and the general relationships between rice varieties and the principal diseases and insect pests of rice, especially rice blast disease and paddy borer, resistance to the latter being considered a secondary expression of varietal response to heavy manuring. The growing period requirements of a given variety in the light of land-use traditions and seasonal farm work and available labor in a given farm area, also, form an important phase of this classification.

Salmon states that studies of ecological relations as a basis for plant breeding have been utilized in Japan as a basis for crop improvement; that the genetico-ecological approach to plant breeding implies a determination of the reaction of varieties to specific environmental conditions and in turn the relation of these conditions to adaptation and distribution of specific varieties; that "specific" environmental conditions include not only the usual climatic factors, such as length of growing season and precipitation, but also such specific factors as summer air and water temperatures, sunshine including the effect of fogs, depth of snow (especially in relation to snow blight), frost damage at various stages of plant development, soil acidity, levels of soil fertility with respect to different mineral elements, specific diseases and insect pests, and the relation of soil fertility to various diseases. He further points out that because of the great range in soil fertility and the universal use of fertilizers, Japan affords a unique opportunity for studies of the relation of soil factors, including fertility, to varietal adaptation and prevalence of diseases.

Matsuo, on the basis of extensive studies of numerous paddy rice varieties, has found that varieties genetically akin show analogous forms under similar environmental conditions, and that a varietial classification based on physiological observations as to growth response to climate, length of day, soil fertility, and diseases and pests is very closely related to a classification based upon varietal distribution within various ecological areas. Hence, a thorough study of ecological characteristics of each agricultural area, its crops, varieties, and cultural methods, provides a practical means for interchange of suitable plant material and cooperative plant improvement work within geographical areas subject to similar ecological conditions—natural or man-made.

Heyne points out that, because of the wide range of soils and climate, Japan has been divided into seven ecological regions for rice breeding and eight for wheat and barley breeding; that one or two national agricultural experiment stations (Figure 17) and a number of prefectural experiment stations are located in each of the regions; that centers have been established within the regions where special characteristics such as re-

action to disease and reaction to particular environments are studied under natural conditions; that facilities of experiment stations within each region are utilized in adaptation and yield studies of results of crossing and selection work carried on at rice, wheat, and barley breeding centers; and that a similar program has been formulated in Japan for other field crops, such as sweet and white potatoes, corn, soybeans, rape, and peanuts.

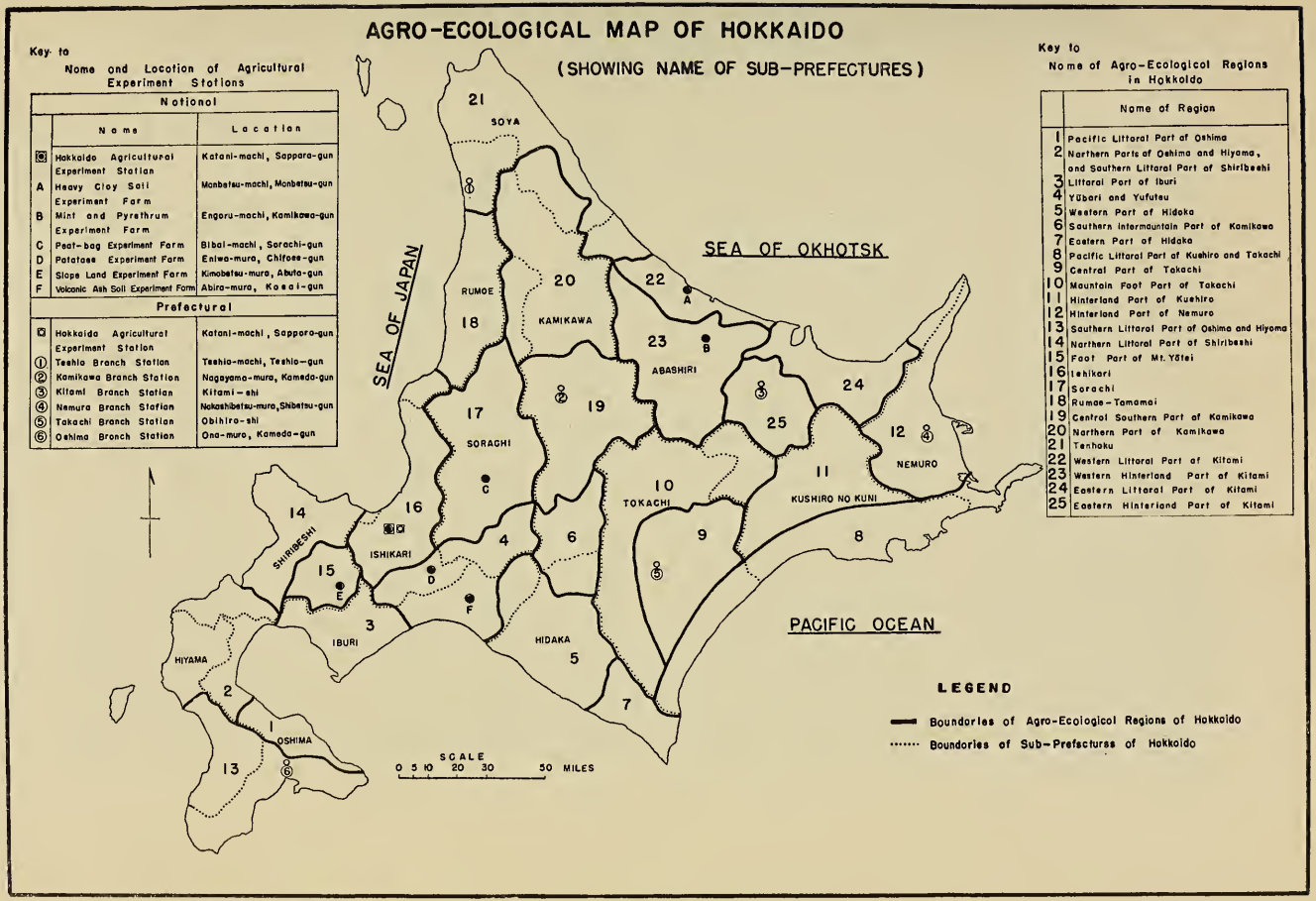
Two Japanese agriculturists, Dr. T. Matsuo of the University of Tokyo, who is mentioned above, and Dr. T. Morinaga, Director of the Agricultural Institute, Ministry of Agriculture and Forestry, recently have advanced a plan for the division of Japan into 11 broad agro-ecological regions (Figure 20) on the basis of climate, soil, crops, varietal adaptations (especially of rice), plant diseases and insect pests, and farm management practices. The prefectures included in each region, as well as some physical and agricultural characteristics especially with regard to rice, are given in Tables XIII and XIII-A, while some major crops, fruit varieties, plant diseases, and insect pests of these regions are given in Tables XIV, XV, XVI, and XVII, respectively. This classification, though it suggests a certain unity of character of the various areas within each agro-ecological region, suggests also the need for a further and finer subdivision of each region into smaller and more uniform agro-ecological districts. Matsuo has formulated such further divisions on the basis of temperature conditions, soil drainage conditions, relief, percentage of winter-cropped acreage, ratio of paddy and upland fields, and status of silkworm culture with its farm-labor requirements.

The division of Hokkaido into 25 agro-ecological regions is shown in Figure 21. This division has been made by the members of the staff of the College of Agriculture of Hokkaido University and it is based on the distinctly different agricultural problems and farm management practices of the various districts of Hokkaido. Some of the major climatic, soil, and agricultural characteristics of the 25 agro-ecological regions of Hokkaido as summarized by the Agricultural Affairs Section, Economic Division, Hokkaido Prefectural Government, and by Bushnell and Ritchie, are as follows:

Region 1. Climate and soil generally unfavorable for agriculture; short growing season, somewhat longer on coast. Slopes and terraces with poor volcanic soil inland; few coastal areas with fertile alluvial soil. No full-time farming; fishermen cultivate small fields of potatoes for their own use. Other crops suitable for area include corn, legumes, vegetables, feed crops and red clover.

Region 2. Cold winds from Pacific generally prevail in growing season, causing cool and misty weather. This area mainly hilly with volcanic soil; fertile alluvial soils found only near coast. Dairy farming practiced; principal products are milk and potatoes. Fog area unsuitable for paddy rice, wheat or barley; soybeans, adzuki beans, proso millet, vegetables, feed corn, and red clover can be grown.

Region 3. Cool and misty along Pacific coast, cool in northern mountainous section but warmer in area near Uchiura Bay (Funka Bay). Fertile black Ando soils along bay shore; almost all of area undulating or hilly. Crops grown are mainly wheat, field beans, and flax, with rice, oats, and potatoes next in importance. Area favorable for growing almost all crops grown in Hokkaido.



Source: Based on Data from Ministry of Agriculture and Forestry, Japan

Figure 21

Region 4. Climate generally unfavorable for crops; danger of early frosts, and foggy coastal area unsuitable for oats, wheat, or barley. Land generally undulating with black Ando soils predominating, except in southern part near Pacific Ocean. Despite good location area only partially developed. Rice grown in sheltered valleys, wheat on fertile uplands, and modern dairying practiced in a few places. In southern part feed crops, white potatoes, corn, and soybeans are suitable, and in northern part some barley can be grown.

Region 5. Favorable climate, little snow in winter, but dense fog common near coast in growing season. Land undulating, with moderately good alluvial soils and some of volcanic type; agriculture not progressive here and limited to valleys; farmers specialize in breeding race horses. Almost any crop grown in Hokkaido would be suitable in parts of this area.

Region 6. An inland mountainous area, with summer temperature higher than along coast, but subject to late spring and early autumn frosts. Agriculture subordinate to forestry.

Region 7. A coastal area, with relatively long frost-free season but subject to heavy fog during growing season. While soybeans, corn, white potatoes, millet, feed crops, oats, red clover, flax, and peppermint could be grown, area is largely a fishing district and practically no agriculture practiced.

Region 8. Pacific coastal area characterized by thick fogs and lack of sunshine in summer. Large portion of the area level, but drainage sometimes poor; fertile alluvial soils found in limited areas. Farmers grow root crops, some vegetables, timothy, and red clover. Dairy farming and horse breeding predominate where pastures are good.

Region 9. Climate typical of inland Pacific coastal areas of Hokkaido. Frosts likely late in spring, fog prevailing during growing period, but late autumn and early winter relatively dry. Regions 9 and 10 known before the war as "the kingdom of peas and beans," with field beans, green peas, and soybeans as principal crops. White potatoes, wheat, barley, millet, corn, oats, timothy, red clover, flax, and sugar beets can be grown and, in a few areas, paddy rice.

Region 10. A piedmont area, with climate similar to that of Region 9; frost-free season shorter, winds at seeding time often destructive, and soil somewhat less fertile.

Region 11. Characterized by shortest growing season in Hokkaido, but autumn and winter comparatively dry. Soils generally of volcanic origin, with poor drainage. A newly colonized area; dairy farming predominates, chief farm crops are potatoes and oats. Early-maturing legumes, white potatoes, millets, buckwheat, feed crops, sugar beets, and flax can be grown.

Region 12. Area has a generally cool and short growing season, but a rather long pasture season with little snow in winter. Land gently undulating interspersed with level plains; soils chiefly volcanic. Dairy farming and horse breeding predominate. The district is isolated; crops suitable are root vegetables, early-maturing legumes, wheat, white potatoes, buckwheat, millets, and feed crops.

Region 13. Warmest area in Hokkaido, with long growing season. Topography: undulating except in western and southeastern parts; soils relatively unproductive. Agriculture not developed, subordinate to fisheries; farms small. Principal crops are potatoes, corn, and soybeans along the coast, and rice in valleys.

Region 14. Region characterized by warm growing season especially in southern part, fogs in late spring, and comparatively short frost-free period. Fishing principal industry. Some rice paddies and productive orchards in valleys; other suitable crops are wheat, barley, oats, red clover, timothy, rapeseed, grapes, and pyrethrum

Region 15. An inter-mountain region, with relatively warm summers, short growing season due to late spring and early fall frosts; snow stays on ground late in spring. Usually the most precipitation in Hokkaido, with deep winter snow. A developing agricultural region with potatoes, oats, beans, and green manures the principal crops; long-term rotations being adopted. Other crops are paddy rice, red clover, flax, and sugar beets.

Region 16. A favorable region with warm, rainy summers and autumns. Lower summer temperatures than Regions 17 and 19. Topography: undulating hills in north, plains in south. Diversified farming practiced, with vegetable gardens, orchards, and dairies in suburbs of cities and on peat soils. Oats, rice, and hay grown on organic soils.

Region 17. Generally level area, enclosing Sorachi Plain, one of the two important rice growing regions in Hokkaido. Summers rainy with relatively high temperatures. Soils peaty and being improved. More oats and soybeans, less rice grown in southern part. Other suitable crops wheat, barley, white potatoes, corn, fruits, vegetables, feed crops, pyrethrum, rapeseed, flax, and sugar beets.

Region 18. Climate mild, generally rainy and rather windy in summer and winter. Area hilly. Fishing most important industry, followed by rice-growing. White potatoes, vegetables, legumes, corn, oats, red clover, flax, sugar beets, and rapeseed can be grown.

Region 19. Climate inland-type with relatively warm, calm summers and cold winters. Soils moderately fertile. Rural population dense; one of the most productive areas in Hokkaido; rice is principal crop; wheat and field beans grown on hills between the Kamikawa (upper stream) and Furano basins; other suitable crops white potatoes, barley, corn, vegetables, oats, red clover, pyrethrum, flax, and sugar beets.

Region 20. Climate cooler than in Region 19, but growing season generally comparatively warm and rainy from July through autumn. Land mountainous or hilly except in central part. Rice is principal crop in southern half of district; in the northern part potatoes are grown, partly for use by starch factories. Other crops are legumes, wheat, barley, oats, red clover, timothy, beets, pyrethrum, flax, and peppermint.

Region 21. Climate cold and windy with a short frost-free period; inland portion of region has shortest growing season in Hokkaido. Topography: undulating and hilly except in some coastal areas, many of which are subject to flood damage. Soils cold and acid; agriculture not well developed. Principal crops are potatoes and oats; other crops are legumes, corn, buckwheat, wheat, barley, red clover, beets, and flax.

Region 22. Soils and climate are similar to those of Region 21. Most precipitation occurs during growing period. District of little agricultural importance. Principal crop, potatoes; wheat, barley, vegetables, sugar beets, and flax grown also.

Region 23. Short growing season; cool in spring and autumn; little precipitation. Topography: hilly and undulating; forests predominate over agricultural lands. Soils and climate more favorable for crops than in Region 22, and there are some productive farms growing peppermint, potatoes, and beans in valleys. Paddy rice, wheat, barley, feed crops, sugar beets, and flax may be grown.

Region 24. Temperature in growing season rather low, higher in Shari area; little precipitation. Land level or undulating with gentle slopes. Soils generally sandy and subject to blowing in spring. Most important wheat growing area in Hokkaido; other important crops are sugar beets, potatoes, green peas, and beans. Irrigated rice not grown. Additional crops suitable are barley, flax, oats, and red clover; apples grown in the Abashiri area.

Region 25. Climate dry and sunny in summer, similar to Regions 23 and 24, winds gentle, and soils fertile. Topography: undulating and hilly, with some level areas. Although farms small, farmers are relatively prosperous, growing principally rice, wheat, and field beans. Peppermint, once an important crop, grown less than formerly. Other suitable crops barley, white potatoes, vegetables, feed crops, sugar beets, and flax.

TABLE

SOME CHARACTERISTICS OF THE

ECOLOGICAL REGIONS:	HOKKAIDO	PACIFIC SIDE OF TOHOKU	JAPAN SEA SIDE OF TOHOKU	HOKURIKU	KANTO
Prefectures or Parts of Prefectures Located Within Each Agro-Ecological Region:	Hokkaido	Eastern Aomori Iwate Miyagi Fukushima	Western Aomori Akita Yamagata	Niigata Toyama Ishikawa Fukui	Ibaraki Tochigi Gumma Saitama Chiba Tokyo Kanagawa
Climatic Characteristics: (Note: Ranges based on data for meteorological stations in the agro-climatological chart of this study.)	Winters very cold, humid. Strong winds. Snowcover October to April or May. Abrupt seasonal changes. Western Hokkaido abundant snow cover September-March, cloudy weather prevailing. Eastern Hokkaido moderate snow cover, winters drier, slightly colder; many clear days. Summers mild, short. Western Hokkaido moderately dry, many clear days. Eastern Hokkaido more humid, foggy east coast June-July, cooler than Western Hokkaido. Annual mean temperature 41°-48° F.; January, coldest month, 13°-27° F.; August, warmest month, 63°-71° F. Absolute maximum 100° F.; absolute minimum —42° F. Annual precipitation 34″-50″; maximum western Hokkaido September - December (5″-6″), eastern Hokkaido September (5″-6″); minimum whole of Hokkaido February-April (1″-2″). Frostless period 97-170 days.	Winters cold, comparatively dry, many clear days; less affected by winter monsoon than west coast; snowcover early November to late April; lightest snow Fukushima Prefecture. Abrupt seasonal transitions. Summers foggy, cloudy, light rains June, July. Annual mean temperature 49°-54° F.; January, coldest month, 26°-36° F.; August, warmest month, 72°-76° F. Absolute maximum 102° F.; absolute minimum —13° F. Annual precipitation 40″-61″; maximum September (6″-10″); minimum January (2″-4″). Frostless period 148-206 days.	Winters cold, humid, numerous cloudy days; abundant snowcover early November to late April. Abrupt seasonal transitions. Inland mountains somewhat continental in climate. Summers warmer, drier than Pacific side, with many clear days. Annual mean temperature 49°-54° F.; January, coldest month, 28°-36° F.; August, warmest month, 75°-77° F. Absolute maximum 100° F. Absolute minimum —12° F. Annual precipitation 49″-89″; maximum November-December (10″-11″); July-September (6″-10″); minimum March - May (3″-5″). Frostless period 167-172 days.	Winters cold, humid, generally overcast sky, very abundant snowcover, frequent storms. Summers warm, frequent sunny days, moderate rain June-July. Greater precipitation in western part. Annual mean temperature 55°-59° F.; January, coldest month, 33°-39° F.; August, warmest month, 78°-81° F. Absolute maximum 102° F.; absolute minimum 5° F. Annual precipitation 47″-112″; maximum November-January (6″-20″); September (4″-11″); minimum April - May (2″-6″). Frostless period 205-269 days.	Winters cold, relatively dry; snow rare, melts quickly, occurs usually only during January-March. Summers humid, warm, cloudy or rainy (June-July). Only 50-60 clear days per year, chiefly in winter. Annual mean temperature 49°-60° F.; January, coldest month, 30°-43° F.; August, warmest month, 69°-81° F. Absolute maximum 102° F.; absolute minimum —2° F. Annual precipitation 50″-88″; maximum September (8″-17″); minimum December (1″-4″). Frostless period 175-314 days.
Ratio of Paddy (irrigated fields, chiefly rice) to Upland (non-irrigated fields, various field crops):	More upland than paddy.	More upland than paddy.	More paddy than upland.	Paddy.	More upland (hilly land) than paddy.
Number of crops per year; rotations:	Single crop.	Single crop (partially three crops in two years) —white potatoes, wheat or barley, and soybeans or upland rice.	Single crop (rice).	Single crop (rice).	Double crop (paddy fields mostly single-cropped.)

Source: Based on data from Ministry of Agriculture and Forestry, Japan, and Central Meteorological Observatory, Tokyo, Japan.

XIII

AGRO-ECOLOGICAL REGIONS OF JAPAN (See Figure 20)

TOSAN	TOKAI	INLAND SEA	SANIN	NORTHERN KYUSHU	NANKAI
Yamanashi Gifu Nagano Shiga	Shizuoka Aichi Mie Nara	Southern Hyogo Okayama Hiroshima Yamaguchi Osaka Kagawa Tokushima Ehime	Kyoto Northern Hyogo Tottori Shimane	Fukuoka Saga Nagasaki Oita Kumamoto	Wakayama Kochi Miyazaki Kagoshima
Winters cold, generally dry in basins, many clear days, snow in mountains. Summers rainy. Local variations with differences in topography. Annual mean temperature 42°-58° F.; January, coldest month, 20°-37° F.; August, warmest month, 64°-79° F. Absolute maximum 101° F.; absolute minimum —13° F. Annual precipitation 39″-92″; maximum September (6″-13″); June-July (4″-11″); minimum January (1″-4″). Frostless period 141-197 days.	Winters mild, relatively dry, colder in interior, many clear days, occasional snow December-March, heavier in western part. Summers rainy (July - October); hot, humid, cooler near Pacific coast. Greatest precipitation, Nara Prefecture. Annual mean temperature 42°-61° F.; January, coldest month, 21°-45° F.; August, warmest month, 62°-82° F. Absolute maximum 100° F.; absolute minimum 2° F. Annual precipitation 47″-200″; maximum August-September (6″-58″); minimum January (1″-5″). Frostless period 153-281 days.	Winters mild, relatively dry, some snow especially in mountains, many days with frost. Frequent fog in mountain basins. Subject to moderate-to-strong winds. Local variations in climate. Summers hot, rainy; morning breezes; evenings oppressive and calm ("yunagi"). Annual mean temperature 52°-62° F.; January, coldest month, 32°-43° F.; August, warmest month, 72°-83° F. Absolute maximum 104° F.; absolute minimum 11° F. Annual precipitation 42″-98″; maximum June, July or September (7″-15″); minimum December-January (1″-4″). Frostless period 205-281 days.	Winters mild, snowy, cloudy, less precipitation in western portion. Summers warm, less precipitation than in winter but subject to storms. Annual mean temperature 56°-59° F.; January, coldest month, 35°-41° F.; August, warmest month, 78°-82° F. Absolute maximum 100° F.; absolute minimum 11° F. Annual precipitation 60″-81″; maximum September (8″-11″); June (7″-10″); December (2″-9″); minimum, February-May (2″-5″). Frostless period 184-234 days.	Winters mild, humid, somewhat rainy or snowy. Greater percentage of clear days in areas facing Inland Sea. Summers rainy, hot. Annual mean temperature 52°-62° F.; January, coldest month, 32°- 45° F.; August, warmest month, 71°-83° F. Absolute maximum 102° F.; absolute minimum 14° F. Annual precipitation 63″-110″; maximum June (10″-22″); September (7″-13″); minimum January (2″-4″). Frostless season 195-303 days.	Winters mildest in Japan; generally fair, clear, comparatively dry. Colder on southwest coast of Kyushu. Summers mild, rainy (April-October). Especially subject to typhoons. Most precipitation Wakayama Prefecture. Annual mean temperature 60°-63° F.; January, coldest month, 41°-46° F.; August, warmest month, 78°-81° F. Absolute maximum 100° F.; absolute minimum 19° F. Annual precipitation 58″ - 120″; maximum June or July (8″-17″); September (7″-21″); minimum January (2″-3″). Frostless season 241-277 days.
More upland (hillside terraces) than paddy.	More paddy than upland.	More paddy than upland.	More paddy than upland.	More paddy than upland.	More upland than paddy.
Double and single crop.	Double crop.	Double crop.	Double crop.	Double crop (partially triple cropped).	Double crop (partially triple cropped)—donble crop: rice or white potatoes and wheat or barley; triple crop: vegetables, rice, and wheat or barley.

TABLE XIII-A

PHENOLOGY OF SOME MAIN RICE VARIETIES OF THE AGRO-ECOLOGICAL REGIONS OF JAPAN

(See Figure 20)

ECOLOGICAL REGIONS:	HOKKAIDO	PACIFIC SIDE OF TOHOKU	JAPAN SEA SIDE OF TOHOKU	HOKURIKU	KANTO	TOSAN	TOKAI	INLAND SEA	SANIN	NORTHERN KYUSHU	NANKAI
Varieties of Rice and Dates of Seeding, Transplanting, Heading, Harvesting, Respectively, at Representative Agricultural Experiment Stations: (Note: For Station names and locations corresponding to these numbers see Figure 17.)	NORIN No. 20 Station* in *Hokkaido:* May 22 (Direct seeding) Aug. 4 Sept. 14 FUKOKU Station #1 in *Hokkaido:* May 13 (Direct seeding) Aug. 9 Sept. 26	RIKU-U No. 132 Station #3 in *Iwate:* Apr. 25 June 9 Aug. 9 Sept. 19 Station #4 in *Miyagi:* Apr. 20 June 5 Aug. 5 Sept. 21 Station #7 in *Fukushima:* Apr. 28 June 4 Aug. 10 Sept. 20	RIKU-U No. 132 Station #2 in *Western Aomori:* Apr. 27 June 1 Aug. 9 Sept. 23 Station #5 in *Akita:* Apr. 20 June 5 Aug. 15 Sept. 26 Station #6 in *Yamagata:* Apr. 15 May 26 July 31 Sept. 8	NORIN No. 1 Station #17 in *Niigata:* Apr. 23 June 1 July 27 Sept. 3 Station #18 in *Toyama:* Apr. 20 June 3 July 24 Sept. 1 Station #19 in *Ishikawa:* Apr. 19 May 29 July 24 Aug. 29 Station #20 in *Fukui:* Apr. 20 June 1 July 26 Sept. 2 GIMBOZU Station #17 in *Niigata:* Apr. 20 June 1 Aug. 29 Oct. 17 Station #18 in *Toyama:* Apr. 22 June 7 Aug. 17 Sept. 22 Station #19 in *Ishikawa:* Apr. 20 May 20 Aug. 26 Oct. 5	NORIN No. 8 Station #8 in *Ibaraki:* May 1 June 15 Sept. 1 Oct. 15 Station #9 in *Tochigi:* Apr. 23 June 7 Aug. 30 Oct. 15 Station #10 in *Gumma:* May 20 June 28 Sept. 7 Oct. 25 Station C in *Saitama:* May 15 June 27 Sept. 7 Nov. 12 Station #12 in *Chiba:* May 1 June 20 Aug. 27 Oct. 5 Station #13 in *Tokyo:* May 10 June 24 Aug. 21 Oct. 18 Station #14 in *Kanagawa:* May 5 June 26 Sept. 1 Oct. 25 AIKOKU Station #8 in *Ibaraki:* May 1 June 15 Aug. 21 Oct. 2	NORIN No. 17 Station #15 in *Yamanashi:* May 22 July 5 Aug. 19 Oct. 22 Station #16 in *Nagano:* May 5 June 30 Aug. 22 Oct. 17 AIKOKU Station #16 in *Nagano:* May 20 June 30 Aug. 23 Oct. 17 Station #21 in *Gifu:* Apr. 21 June 5 Aug. 15 Oct. 6	AICHI-ASAHI Station #22 in *Shizuoka:* May 10 June 25 Sept. 7 Nov. 2 Station #23 in *Aichi:* May 11 June 30 Sept. 11 Nov. 10 Station #24 in *Mie:* May 15 June 27 Sept. 7 Nov. 11 Station #28 in *Nara:* —— —— Aug. 28 Oct. 20	ASAHI Station #30 in *Southern Hyogo:* May 10 June 25 Sept. 12 Nov. 10 Station #33 in *Okayama:* May 15 July 4 Sept. 12 Nov. 10 Station #34 in *Hiroshima:* May 5 June 25 Sept. 2 Oct. 25 Station #35 in *Yamaguchi:* May 10 June 25 Sept. 2 Oct. 30 Station #27 in *Osaka:* —— —— Sept. 12 Nov. 7 Station #37 in *Kagawa:* May 5 June 30 Sept. 9 Nov. 2 Station #36 in *Tokushima:* May 10 June 25 Sept. 7 Oct. 31 Station #38 in *Ehime:* May 20 July 2 Sept. 8 Nov. 1	NORIN No. 22 Station #26 in *Kyoto:* May 10 June 24 Sept. 1 Oct. 14 Station #31 in *Tottori:* May 15 June 28 Aug. 30 Oct. 26 Station #32 in *Shimane:* May 10 July 1 Aug. 31 Oct. 14 NORIN No. 8 Station #26 in *Kyoto:* May 10 June 24 Sept. 2 Oct. 20 Station #31 in *Tottori:* May 15 June 28 Sept. 1 Oct. 31	NORIN No. 18 Station G in *Fukuoka:* May 25 July 1 Sept. 9 Oct. 28 Station #41 in *Saga:* May 23 June 30 Sept. 9 Oct. 27 Station #42 in *Nagasaki:* —— July 4 Sept. 8 Nov. 6 Station #44 in *Oita:* May 28 June 29 Sept. 7 Nov. 3 Station #43 in *Kumamoto:* May 16 June 28 Sept. 9 Nov. 2 NORIN No. 12 Station #40 in *Fukuoka:* —— —— Sept. 11 Nov. 5 Station #41 in *Saga:* Apr. 25 —— Sept. 10 Oct. 29 Station #42 in *Nagasaki:* May 22 July 1 Sept. 7 Oct. 30	NORIN No. 18 Station #39 in *Kochi:* May 5 June 23 Sept. 10 Oct. 16 Station #45 in *Miyazaki:* May 25 June 29 Sept. 7 Oct. 23 Station #46 in *Kagoshima:* May 28 June 30 Sept. 7 Oct. 15 ZUIHO Station #45 in *Miyazaki:* May 23 June 28 Sept. 12 Oct. 30 Station #46 in *Kagoshima:* May 28 June 28 Sept. 14 Nov. 6

Source: Based on Data from Ministry of Agriculture and Forestry, Japan.

* Kamikawa Branch Station in Kamikawa-gun (Kamikawa County).

TABLE XIV

MAJOR AGRICULTURAL CROPS OF THE AGRO-ECOLOGICAL REGIONS OF JAPAN *

ECOLOGICAL REGIONS:		HOKKAIDO	PACIFIC SIDE OF TOHOKU	JAPAN SEA SIDE OF TOHOKU	HOKURIKU	KANTO	TOSAN	TOKAI	INLAND SEA	SANIN	NORTHERN KYUSHU	NANKAI
Staple Food Crops		Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice	Paddy rice
		.....	.....	.....	.....	Upland rice	Upland rice	Upland rice	Upland rice	.....	Upland rice	Upland rice
		Wheat	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat
		Barley	Barley	Barley	Barley	Barley	Barley	Barley	Barley	Barley	Barley	Barley
		Naked barley	.....	.....	.....	Naked barley	Naked barley	Naked barley	Naked barley	Naked barley	Naked barley	Naked barley
		.....	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes	Sweet potatoes
		White potatoes	White potatoes	White potatoes	White potatoes	White potatoes	White potatoes	White potatoes	White potatoes	White potatoes	White potatoes	White potatoes
Minor Cereal Crops		Oats	.....	.....	.....	.....	.....	.....	.....	.....	Oats	Oats
		Rye	.....	.....	.....	.....	Rye	.....	.....	.....	.....	.....
		Buckwheat	Buckwheat	Buckwheat	Buckwheat	Buckwheat	Buckwheat	Buckwheat	Buckwheat	.....	Buckwheat	Buckwheat
		Corn	Corn	Corn	.....	Corn	Corn	Corn	Corn	.....	Corn	Corn
		Foxtail millet	Foxtail millet	Foxtail millet	Foxtail millet	Foxtail millet	.....	.....	.....	.....	.....	.....
		Barnyard millet	Barnyard millet	Barnyard millet	.....	Barnyard millet	Barnyard millet	.....	.....	.....	.....	.....
		Proso millet	.....	.....	.....	.....	Proso millet	Proso millet	Proso millet	.....	.....	.....
		Sorghum	.....	.....	.....	Sorghum	.....	.....	.....	.....	.....	.....
Pulses		Soybeans	Soybeans	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Adzuki beans	Adzuki beans	Adzuki beans	Adzuki beans	Adzuki beans	Adzuki beans	.....	Adzuki beans	Adzuki beans	Adzuki beans	Adzuki beans
		Kidney beans	.....	.....	.....	.....	.....	.....	Kidney beans	Kidney beans	Kidney beans	.....
		.....	.....	.....	.....	Peanuts	.....	.....	.....	.....	.....	.....
Industrial Crops		.....	Mulberry	Mulberry	Mulberry	Mulberry	Mulberry	Mulberry	Mulberry	Mulberry	Mulberry	Mulberry
		.....	.....	.....	.....	Tea	.....	Tea	.....	Tea	.....	.....
		Tobacco	Tobacco	Tobacco	.....	Tobacco	.....	Tobacco	Tobacco	Tobacco	Tobacco	Tobacco
	Oil Crops	Rapeseed	Rapeseed	.....	.....	Rapeseed	Rapeseed	Rapeseed	Rapeseed	.....	Rapeseed	Rapeseed
		.....	.....	.....	.....	Sesame	.....	.....	.....	.....	.....	.....
	Fiber Crops	Flax	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		.....	.....	.....	Japanese paper mulberry	.....	.....	.....	.....	.....	Japanese paper mulberry	.....
		.....	.....	.....	.....	Hemp	Hemp	.....	.....	.....	.....	.....
		.....	.....	.....	.....	Cotton	.....	.....	.....	.....	.....	.....
		.....	.....	.....	.....	.....	Basket ozier	.....	.....	.....	.....	.....
		.....	.....	.....	.....	.....	.....	.....	Paper bush	.....	.....	Paper bush
		.....	.....	.....	.....	.....	.....	.....	Mat rush	.....	.....	.....
		.....	.....	.....	.....	.....	.....	.....	.....	.....	Shichito mat grass	.....
		.....	.....	.....	.....	.....	.....	.....	.....	.....	Jute	.....
		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Ramie
	Miscellaneous Crops	Pyrethrum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Peppermint	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		.....	*Konnyaku*	.....	.....	*Konnyaku*	.....	*Konnyaku*	*Konnyaku*	*Konnyaku*	*Konnyaku*	.....

* In this table the term "major crops" usually implies crops of acreage exceeding 500 hectares (1,235 acres) in any given prefecture.

TABLE XIV—(Continued)

MAJOR AGRICULUTURAL CROPS OF THE AGRO-ECOLOGICAL REGIONS OF JAPAN*

ECOLOGICAL REGIONS:	HOKKAIDO	PACIFIC SIDE OF TOHOKU	JAPAN SEA SIDE OF TOHOKU	HOKURIKU	KANTO	TOSAN	TOKAI	INLAND SEA	SANIN	NORTHERN KYUSHU	NANKAI
Vegetable Crops	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*	*Daikon*
	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage	Cabbage
	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin	Pumpkin
	.....	Dasheen	.....	Dasheen	Dasheen	Dasheen	Dasheen	Dasheen	Dasheen	Dasheen	Dasheen
	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant	Eggplant
	Onions	Onions	Onions	Onions	Onions	Onions	Onions	Onions	Onions	Onions	.....
	Cucumbers	Cucumbers	Cucumbers	Cucumbers	Cucumbers	.....	Cucumbers	.....	.....	Cucumbers	.....
	Carrots	Carrots	.....	.....	Carrots	.....	Carrots	.....	.....	.....	.....
	Corn	Corn	Corn	.....	Corn	.....	.....	.....	.....	.....	.....
	Burdock	Burdock	.....	.....	Burdock	Burdock	.....	.....	.....	.....	.....
	Soybeans	Soybeans	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Watermelon	.....	.....	.....	Watermelon	.....	Watermelon	.....	.....	Watermelon	.....
	Tomatoes	.....	.....	.....	Tomatoes	.....	Tomatoes	.....	.....	.....	.....
	Oriental pickling melon	.....	.....	Oriental pickling melon	Oriental pickling melon	.....	Oriental pickling melon	.....	.....	.....	.....
	.....	.....	.....	.....	Lotus root	.....	Lotus root	Lotus root	.....	Lotus root	.....
	.....	.....	.....	.....	.....	.....	.....	Bamboo shoots	Bamboo shoots	Bamboo shoots	.....
	.....	.....	.....	.....	Broadbeans	.....	.....	.....	.....	Broadbeans	.....
	Kidney beans	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Turnips	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	.....	.....	.....	.....	Spinach	.....	.....	.....	.....	.....	.....
Forage Crop	.....	.....	.....	.....	.....	Chinese milk vetch	.....	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch
Green Manure Crops	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	Chinese milk vetch	.....	Chinese milk vetch	Chinese milk vetch
	Soybeans	.....	.....	.....	Soybeans	Soybeans	Soybeans	Soybeans	.....	Soybeans	.....
Fruit Crops	Apples	Apples	Apples	.....	.....	Apples	.....	.....	.....	.....	.....
	.....	.....	.....	.....	Satsuma oranges	.....	Satsuma oranges	Satsuma oranges	.....	Satsuma oranges	Satsuma oranges
	.....	Pears	.....	.....	.....	.....	.....	.....	Pears	.....	.....
	.....	.....	.....	.....	.....	Grapes	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....	.....	.....	Persimmons	Persimmons	.....	.....
	.....	.....	.....	.....	.....	.....	.....	.....	Chestnuts	.....	.....
	.....	.....	.....	.....	.....	.....	.....	.....	Peaches	.....	.....
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Japanese apricots

Source: Based on Unpublished Data from Ministry of Agriculture and Forestry, Japan.

* In this table the term "major crops" usually implies crops of acreage exceeding 500 hectares (1,235 acres) in any given prefecture.

TABLE XV

FRUIT SPECIES AND SOME FRUIT VARIETIES OF THE AGRO-ECOLOGICAL REGIONS OF JAPAN

ECOLOGICAL REGIONS:	HOKKAIDO	PACIFIC SIDE OF TOHOKU	JAPAN SEA SIDE OF TOHOKU	HOKURIKU	KANTO	TOSAN	TOKAI	INLAND SEA	SANIN	NORTHERN KYUSHU	NANKAI
Citrus Fruits (Note: For varieties of major citrus species grown in Japan see citrus fruit section of this paper.)					*Unshu* (Satsuma orange) *Wase-unshu* (early *Unshu*) *Natsudaidai* (summer orange)		*Unshu* (Satsuma orange) *Wase-unshu* (early *Unshu*) *Natsudaidai* (summer orange) Washington Navel *Miyagawawase*	*Unshu* (Satsuma orange) *Wase-unshu* (early *Unshu*) *Natsudaidai* (summer orange) Washington Navel *Hasaku* orange *Iyo* orange *Naruto* orange Lemons	*Unshu* (Satsuma orange) *Wase-unshu* (early *Unshu*) *Natsudaidai* (summer orange)	*Unshu* (Satsuma orange) *Wase-unshu* (early *Unshu*) *Natsudaidai* (summer orange) Washington Navel *Kishu-mikan* mandarin *Kinkan* orange	*Unshu* (Satsuma orange) *Wase-unshu* (early *Unshu*) *Natsudaidai* (summer orange) Washington Navel *Hasaku* orange *Kinkan* orange *Ponkan* tangerine *Hynga-natsudaidai* (new summer orange) *Sanpokan* orange Lemons
Apple Varieties	Early Summer Pearmain McIntosh Jonathan Rall's Genet Delicious Ben Davis Tallman's Sweet Astrachan Red White Pippin King of Tompkins County	Early Summer Pearmain McIntosh Jonathan Rall's Genet Delicious Ben Davis Astrachan Red White Pippin Golden Delicious Stark Delicious Fameuse *Indo*	Early Summer Pearmain McIntosh Jonathan Delicious Ben Davis Golden Delicious Stark Delicious Richard Delicious *Indo*	Early Summer Pearmain McIntosh Jonathan Rall's Genet Delicious Golden Delicious *Indo*	Early Summer Pearmain McIntosh Jonathan Rall's Genet Delicious	Early Summer Pearmain McIntosh Jonathan Rall's Genet Delicious Ben Davis Stark Delicious *Indo*	Early Summer Pearmain McIntosh Jonathan Rall's Genet Delicious	Early Summer Pearmain McIntosh Jonathan Golden Delicious		Early Summer Pearmain	
Peach Varieties		*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* *Okubo-suimitsu* Amsden June	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* Shanghai Carman Amsden June	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* Carman Amsden June *Wase-suimitsu* *Tsuchikurawase*	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* *Okubo-suimitsu* *Wase-suimitsu* *Tanakawase*	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* *Okubo* *Okayama No. 5* *Nishinowase* *Showa*	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Okubo* *Kobayashi* *Yamato-suimitsu* *Nakayamakinto* Elberta	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* Carman *Wase-suimitsu* *Tsuchikurawase* *Okubo* *Shingyoku*	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Rikaku-suimitsu* *Wase-suimitsu* *Tsuchikurawase* *Okubo* *Ijimawase*	*Denjuro* *Hakuto* *Tenshin-suimitsu* *Doyo-suimitsu* *Tachibanawase* *Rikaku-suimitsu* *Okubo*	*Denjuro* *Hakuto* *Doyo-suimitsu* *Rikaku-suimitsu* *Okubo* *Shanghai*
Loquat Varieties					*Tanaka* *Kusunoki*		*Tanaka* *Mogi* *Kusunoki*	*Tanaka* *Mogi* *Kusunoki*		*Tanaka* *Mogi*	*Tanaka* *Mogi*

Pear Varieties	*Chojuro* *Mishirazu* *Sonai* Bartlett	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Waseaka* *Okusankichi* Bartlett LaFrance Kieffer Flemish Beauty	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Waseaka* Bartlett LaFrance Flemish Beauty Kieffer	*Chojuro* *Nijuseiki* *Yakumo* *Shinko* *Waseaka* *Okusankichi* *Niitaka* Bartlett Doctor Jules Gyot		*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Ishiiwase* *Okusankichi* Bartlett LaFrance Doctor Jules Gyot Alexandrine Douillard	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Waseaka* *Okusankichi* *Ishiiwase* *Hakata-ao*	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Waseaka* *Okusankichi* *Meigetsu* *Taihaku* *Doitsu* Bartlett	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Ishiiwase* *Okusankichi* *Niitaka*	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Waseaka* *Okusankichi* *Niitaka* *Hakata-ao* *Imamura-aki* *Tosa-nishiki*	*Chojuro* *Nijuseiki* *Yakumo* *Kikusui* *Hakata-ao* *Okusankichi*
Japanese Persimmon Varieties		*Hachiya* *Fuyu** *Jiro** *Gosho** *Aizumishirazu* *Hiratanenashi* *Amashakume** *Emon* *Myotan*	*Hachiya* *Aizumishirazu* *Hiratanenashi*	*Hachiya* *Fuyu* *Jiro* *Gosho* *Aizumishirazu* *Hiratanenashi* *Amashakume* *Saijo* *Fuji* *Jishi* *Monpei*	*Hachiya* *Fuyu* *Jiro* *Gosho* *Aizumishirazu* *Hiratanenashi* *Amashakume* *Emon* *Zenjimaru* *Yokono* *Yotsumizo*	*Hachiya* *Fuyu* *Jiro* *Gosho* *Aizumishirazu* *Hiratanenashi* *Amashakume* *Fuji*	*Hachiya* *Fuyu* *Jiro* *Gosho* *Aizumishirazu* *Mino-gaki* *Amashakume* *Fuji* *Yotsumizo* *Yokono*	*Hachiya* *Fuyu* *Jiro* *Gosho* *Saijo* *Hanagosho* *Atago* *Yokono* *Gionbo*	*Hachiya* *Fuyu* *Jiro* *Gosho* *Saijo* *Hiratanenashi* *Hanagosho* *Yokono*	*Fuyu* *Jiro* *Gosho* *Hagakure* *Kyara* *Yokono*	*Fuyu* *Jiro* *Gosho* *Hagakure* *Yokono* *Tanenashi* *Miyazaki*
Grape Varieties	Delaware Campbell's Early Niagara	Delaware Campbell's Early *Koshu* Concord Niagara Brighton	Delaware Campbell's Early *Koshu* Concord Niagara Black Hamburg	Delaware Campbell's Early *Koshu*	Delaware Campbell's Early *Koshu* Concord Champion	Delaware Campbell's Early *Koshu* Concord *Koshusanjaku* Black Queen Adirondack Champion (See **)	Delaware Campbell's Early *Koshu*	Delaware Campbell's Early *Koshu* *Koshusanjaku* Muscat of Alexandria***	Delaware Campbell's Early *Koshu* *Koshusanjaku*	Delaware Campbell's Early *Koshu* Niagara	Delaware Campbell's Early
Cherry Varieties	Napoleon Bigarreau Governor Wood Early Purple Guigne Black Tartarian	Napoleon Bigarreau Governor Wood Early Purple Guigne Black Tartarian	Napoleon Bigarreau Governor Wood Early Purple Guigne	Napoleon Bigarreau Florence Yellow Spanish		Napoleon Bigarreau Governor Wood Early Purple Guigne Black Tartarian Rockport Bigarreau Bigarreau Jabouly					
Mume Plum Varieties (Japanese Apricot)		*Shirokaga* *Bungo* *Koume* *Yoro*	*Shirokaga* *Bungo* *Koume*	*Shirokaga* *Bungo* *Nagatsuka* *Yoro*	*Shirokaga* *Bungo* *Koume* *Yoro* *Hanakami* *Akebono*	*Shirokaga* *Bungo* *Koume* *Yoro* *Hanakami* *Aojiku* *Nagatsuka*	*Shirokaga* *Bungo* *Koume* *Yoro* *Hanakami* *Aojiku* *Nagatsuka*	*Shirokaga* *Bungo* *Koume* *Yoro* *Hanakami* *Aojiku* *Rinshu*	*Shirokaga* *Yoro* *Hanakami* *Rinshu*	*Shirokaga* *Bungo* *Koume* *Yoro* *Hanakami* *Aojiku*	*Shirokaga* *Bungo* *Koume* *Yoro* *Hanakami*
Japanese Plum Varieties	*Terada* Santa-Rosa Formosa *Sorudam* Kelsey	*Terada* Santa-Rosa Formosa	*Terada* Santa-Rosa Formosa	*Terada* Santa-Rosa Formosa	*Terada* Santa-Rosa Formosa	*Terada* Santa-Rosa Formosa *Sorudam* Beauty	*Terada* Santa-Rosa Formosa	*Terada* Santa-Rosa Formosa *Sorudam* Kelsey	*Terada* Santa-Rosa	*Terada* Santa-Rosa	*Terada* Santa-Rosa
Fig Varieties				*Masui Dauphine* White Genoa *Horaigaki*	*Masui Dauphine* White Genoa *Horaigaki*	*Masui Dauphine* White Genoa *Horaigaki*	*Masui Dauphine* White Genoa *Horaigaki*	*Masui Dauphine* White Genoa San Pedro Black	*Masui Dauphine* White Genoa *Horaigaki*	*Masui Dauphine* White Genoa *Horaigaki*	*Masui Dauphine* White Genoa *Horaigaki*

Source: Based on unpublished data from Ministry of Agriculture and Forestry, Japan.

* Only Fukushima Prefecture. ** In Tosan District grapes grown chiefly in Yamanashi Prefecture. *** Grown in greenhouse.

TABLE XVI

MAJOR DISEASES OF FIELD AND ORCHARD CROPS IN THE AGRO-ECOLOGICAL REGIONS OF JAPAN

HOST CROP	DISEASES	Hokkaido	Pacific Side of Tohoku	Japan Sea Side of Tohoku	Hokuriku	Kanto	Tosan	Tokai	Inland Sea	Sanin	Northern Kyushu	Nankai
RICE	Blast (Leaf blast, Neck rot, Node blast) (*Piricularia oryzae* Br. et Cav.) (*P. grisea* (C.) Sacc.) (*Dactylaria grisea* Shir.)	×××	×××	×××	×××	×××	×××	×××	×××	×××	×××	×××
	Sclerotiosis (Rhizoctonia sheath spot, Sclerotium disease, Hypochnose) (*Corticium sasakii* (S.) Mats.) (*Rhizoctonia oryzae* R. et G.)			××		×	××	××	××	×××	×××	×××
	Stem rot (Sclerotium disease, Sclerotial blight, Culm rot) (*Helminthosporium sigmoideum* var. *irregulare* Cr. et Tul.) (*Leptosphaeria salvinii* Catt.) (*Sclerotium oryzae* Catt.)	×	××	××	×××	××	××	××	×××	×	×××	××
	Sesame leaf spot (Spotted leaf blight, Brown spot, Helminthosporiose leaf spot) (*Ophiobolus miyabeanus* Ito et Kur.) (*Helminthosporium oryzae* Br. et Haan.) (*Cochliobolus miyabeanus* Ito et Kur.)	×	×	×	×××	××	××	××	×××	×××	×××	×××
	Bacterial leaf blight (White blast) (*Pseudomonas oryzae* U. et Ish.)		×	×	×	××	×	×××	×××	××	×××	×××
	Seedling rot (*Achlya flagellata* Cok.) (*A. prolifera* Nees)	×	×××	×××	××	×				×	×	×
	White tip (physiological) (*Aphelenchoides oryzae* Yokoo)		×		××	×	×	×	×		×××	××
	Virus diseases:											
	Dwarf (Stunt disease) (*Oryza virus 1* Fuk.)		×								×	×××
	Stripe (*Oryza virus 2* Kur.)		×			××	×	×			×	×
	Bakanae disease (Foot rot) (*Gibberella fujikuroi* (S.) Woll.) (*Lisea fujikuroi* Saw.)	××	×	×	×						×	×
	Smuts (various)	×		×	×		×	×		×	×	×
WHEAT AND BARLEY	Leaf rust (Brown rust, Orange leaf rust) (*Puccinia triticina* Eriks.)	×××	××	××	×××	××	××	××	×××	×××	××	××
	Stripe rust (Spring rust, Yellow rust) (*Puccinia glumarum* (S.) Eriks. et Henn.) (*P. simplex* (K.) Eriks. et Henn.)		×	×	×	××	××	××	×××	×××	×××	×
	Stem rust (Black rust) (*Puccinia graminis* Pers.)	×	×		×	×	××	×		×××	×××	×××
	Dwarf rust		×	×	×××						×××	××
	Scab (*Gibberella saupinetii* (M.) Sacc.)	×××	×	×		××	×××	×××	×××	×××	×××	×××
	Powdery mildew (*Erysiphe graminis* Dec.)		×	×	××	××	××	××	×××	×××	×××	×××
	Snow damage (Snow blight, Snow rot, Snow mold):											
	Typhula (*Typhula itoana* Imai)	××		×××	×××		×					
	Pink snow blight (*Fusarium nivale* Ces.)	×		×××	×××							
	Brown snow blight (*Pythium iwayamai* S. Ito)			×××	×××			×				
	Not specified		××		×××	××	××			××		

Wheat stripe (*Cephalosporium gramineum* N. et I.)			×			×	××	×××			×
Barley stripe (*Pyrenophora graminea* (R.) Ito et Kur.)	××		×	×	××	××	××	×	×××	×	×
Smut diseases:											
Covered smut of barley (*Ustilago hordei* (D.) K. et S.)	×		×		××	×	×	×	×	×	×
Loose smut of barley (*Ustilago nuda* (J.) K. et S.)	××		×			×		×××	×××	×	××
Stinking smut of barley (Bunt) (*Tilletia panicii* B. et R.)		×	×			×	×				×
Loose smut of wheat (*Ustilago tritici* (P.) Rostr.)			×		×	×	×	×××		×	××
Stinking smut of wheat (Bunt) (*Tilletia tritici* (B.) Wint.) (*T. laevis* Kuhn)	×		×		×	×	××	×	×××	××	×
Take-all of barley and wheat (*Ophiobolus graminus* Sacc.)		×		×	××	××	××	×	××	×	××
Leaf scald of barley and rye (*Rhynchosporium secalis* (O.) J. J. Davis)				×××	×	×	×		××	××	××
Foot rot of barley and wheat (*Corticum gramineum* Ik. et Mats.)					×	×	×		××	×	×
Virus diseases:											
Rosette (Green mosaic of wheat and barley)		×			×	×	××			×	×
Mosaic of wheat		×			×	×	××	××	××	×	×
Northern mosaic	×	×									
Net blotch of barley (*Pyrenophora teres* (D.) Drechs.)	×××			××	×	×	×	×		×	×
Spot blotch (*Helminthosporium sativum* (P.) K. et B.)	××			×			×			×	×
WHITE POTATO Virus diseases:											
Crinkle mosaic (*Marmor solani* Holmes)		×××	××	×××	××	×	××				
Leaf roll (*Corium solani*)		××	×	×××	××	××	××				
Streak		×	×		××		××				
Rugose mosaic (*Marmor upsilon* Holmes)					××	×	××				
Not specified	×××							×××	×××	×××	××
Late blight (Wet rot) (*Phytophthora infestans* (M.) De B.)	×××	×××	×××	×××	×××	××	××	××	×××	×××	×××
Early blight (*Alternaria solani* (E. et M.) J. et Gr.)	×××			×	××	××	×	××	××	××	××
Potato scab (Corky scab, Actinomycosis, American scab, Brown scab, Common scab, Deep scab, Oospora scab, Potato canker) (*Actinomyces scabies* (T.) Gu.) (*Streptomyces scabies* (T.) Waks. et Hen.) (*Oospora scabies* Thax.)	×			×	×	×	×	×	×××	××	××
Bacterial wilt (Brown rot) (*Pseudomonas solanacearum* E. F. Smith) (*Phytomonas solanacearum* (EFS) Berg.)	×	×		×	×	×	×	×		××	××
Black scurf (Rhizoctonia scab, Rhizoctonia disease, Stem canker, Stem rot, Scurf, Rosette, Collar fungus, Brown stem, Black scab, Black speck) (*Rhizoctonia solani* Kuehn) (*Pellicularia filamentosa* (P.) Rog.) (*Corticium solani* (P. et D.) B. et G.)	×××			×		×				×	×
Soft rot (*Bacillus corotovora* Jones) (*Erwinia carotovora* (J.) Holl.) (*Bacillus aroideae* Towns.) (*Erwinia aroideae* (T.) Holl.)	×	×	×		××	×	×			××	××
Bacterial ring rot (*Corynebacterium sepedonicum* (S.) Sh. et Bu.) (*Phytomonas sepedonica* (S.) Mag.)		×	×		×					×	×

NOTE: Ranging from × meaning relatively low to ××× meaning relatively high prevalence.

[*Continued next page*]

TABLE XVI—(Continued)

MAJOR DISEASES OF FIELD AND ORCHARD CROPS IN THE AGRO-ECOLOGICAL REGIONS OF JAPAN

HOST CROP	DISEASES	Hokkaido	Pacific Side of Tohoku	Japan Sea Side of Tohoku	Hokuriku	Kanto	Tosan	Tokai	Inland Sea	Sanin	Northern Kyushu	Nankai
SWEET POTATO	Black rot (*Ceratostomella fimbriata* (Ell. et H.) Ell.) (*Endoconidiophora fimbriata* (Ell. et H.) Dav.)		×	×	××	×××	××		×××	×××	×××	×××
	Violet root rot (Mompa disease) (*Helicobasidium mompa* Tan.)				×	×	×	×	×	×	××	××
	Soft rot (Ring rot) (*Rhizopus nigricans* Ehr.)					×	×	××		×××	×××	××
	Stem rot (*Fusarium oxysporum* Schl.) (*F. bulbigenum* Cke. et Mass.) (*F. semitectum* B. et R.) (*F. batatas* Wr.)					×	×	×	××	××	×	×
	Dry rot (*Diaporthe batatatis* (E. et H.) Har. et Field)					×	×	×				×
	Black spot (*Macrosporium bataticola* Ik.)					×	××	×××	××	××	×	××
	Scurf (*Monilochaetes infuscans* Ell. et Hal.)					×	×	×		××	×	×
SOYBEAN	Purple speck (Purple seed stain) (*Cercosporina kikuchii* Mats. et Tomo.)		××	××	×××	×	×	×	××	××	×	×
	Bacterial pustule (Leaf blight) (*Zanthomonas phaseoli* var. *sojense* (H.) St. et Burk.) (*Phytomonas phaseoli* var. *sojense* (H.) Burk.) (*Pseudomonas phaseoli* (EFS) var. *sojense* Hedges)				××	×			××	××	×××	×××
	Bacterial blight (*Pseudomonas glycinea* (C.) var. *japonica* (T.) Ell.) (*Phytomonas glycinea* var. *japonica* (T.) Mag.)	×			××				××		×	×
	Southern sclerotium rot (*Corticium centrifugum* (L.) Bres.) (*Hypochnus centrifugus* (L.) Tul.)		×	×					××		×××	××
	Rust (*Phakospora pachyrhizi* Syd.) (*P. sojae* (H.) Saw.)					×	×	×	×××		××	××
	Anthracnose (*Glomerella glycines* Leh. et Wolf.) (*Colletotrichum glycines* Hori)	×	×	×	×	×	×	×			×	×
	Downy mildew (*Peronospora manshurica* (N.) Syd.)	××			××			×	×			×
	Virus diseases (various)	×	×					×		××	××	×
CITRUS	Scab (*Elsinoe fawcetti* Bit. et Jenk.) (*Sphaceloma fawcetti* Jenk.) (*Cladosporium citri* Faw.) (*Ovularia citri* Br. et Far.)					×		×××	×××		×××	×××
	Canker (*Pseudomonas citri* Ha.) (*Phytomonas citri* (H.) Ber.) (*Bacterium citri* (H.) Doid.)							×××			×××	×××
	Common green mold (Green mold rot) (*Penicillium digitatum* Sacc.) (*P. olivaceum* Wehm.)					××		×××				××
	Blue contact mold (*Penicillium* sp.)							×××				××
	Pink disease (*Penicillium* sp.)										×××	×××
	Greasy spot (*Phomopsis citri* Faw.)							××	×××			×

APPLE	Blossom blight (Blossom-end rot, Fire blight, Fire blight canker, Fruit blight, Leaf blight, Twig blight) (*Bacillus amylovorus* (B.) Trev.) (*Erwinia amylovora* (B.) Wins.)		×××	×××			×××		××			
	Violet root rot (*Helicobasidium mompa* Tan.)	×	×××	×××			××					
	Powdery mildew (*Podosphaera oxyacanthae* (D.C.) DeB.)	×	××	××			×		××			
	Blotch (*Marssonina mali* (P.H.) Ito)	×	××	××			×					
	Rust (Apple rust) (*Gymnosporangium yamadae* Miy.)	×	×	×			×					
PEAR	Black spot (*Alternaria kikuchiana* Tan.)		×××	×××	××	××		×××	×××	×××	×××	
	Rust (*Gymnosporandium shiraianum* Hara)	×			×	×	×	×	×××	××	×××	×××
	Scab (*Endostigme pirina* (A.) Syd.) (*Sphaerella pirina* Cooke) (*Fusicladium pirinum* Fuck.) (*Venturia pirina* (C.) Aderh.)	××				×	××	×××	×××	××	××	×
PEACH	Leaf curl (Curl, Curly leaf, Leaf blister) (*Taphrina deformans* (B.) Tul.) (*Exoascus deformans* (B.) Ekl.)	×				×		××	××	×××		××
	Anthracnose (*Gloeosporium laeticola* Berk.)	×				×		×××		×		××
	Canker (*Valsa japonica* Miy. et Hemmi)								××	×××		××
	Fusicoccum disease					×××						
	Die-back (*Leucostoma persoonii* (N.) Togashi) (*Valsa leucostoma* Fr.)							×××				
PERSIMMON	Circular spotted fruit or leaf cast (*Mycosphaerella nawae* H. et I.)		××		×	××	×××	×××	×××	×××	×	××
	Angular leaf spot (*Cercospora kaki* Ell. et Ev.)				×	××	××	××	×××	×××	××	××
	Anthracnose (*Gloeosporium kaki* Hori)					×	×××	×××	××	××	×××	×××
	Black spot (*Fusicladium levieri* Matn.)					×		××		×		××
GRAPE	Anthracnose (Not specified)	×		××	××	××	×××	××	×××	×××	×××	
	Anthracnose—Bitter rot (Ripe rot) (*Glomerella cingulata* (St.) Sp. et. Schr.) (*G. fructigena* (C.) Sacc.) (*G. rufomaculans* (B.) Sp. et Schr.)					××		××		××		
	Anthracnose—Elsinoe (Bird's eye rot disease) (*Elsinoe ampelina* (DeB.) Sheer) (*Sphaceloma ampelina* DeB.) (*Gloeosporium ampelophagum* Sacc.)										×××	
	Downy mildew (Blight, Brown rot, Gray mold) (*Plasmopara viticola* (B. et C.) Barl. et De Toni) (*Botrytis viticola* B. et C.)	×					×		××	×××	××	
	Powdery mildew (*Uncinula necator* (S.) Burr.) (*Erysiphe necator* Schw.)				××	×	×		××	×	××	
	Leaf spot (various)				×	×	×	×××			×	

Source: Based on Data from Ministry of Agriculture and Forestry, Japan, and Natural Resources Section, GHQ, SCAP.

NOTE: Ranging from × meaning relatively low to ××× meaning relatively high prevalence.

TABLE XVII

MAJOR INSECT PESTS OF FIELD AND ORCHARD CROPS IN AGRO-ECOLOGICAL REGIONS OF JAPAN

HOST CROP	INSECT PEST	Hokkaido	Pacific Side of Tohoku	Japan Sea Side of Tohoku	Hokuriku	Kanto	Tosan	Tokai	Inland Sea	Sanin	Northern Kyushu	Nankai
RICE	Rice stem borer (*Chilo supressalis* Walker)	××	×××	×××	××	×××	×××	×××	×××	×××	×××	××
	Paddy borer (*Schoenobius incertellus* Walker)							×××	×××		×××	×××
	Purplish stem borer (*Sesamie inferens* Walker)		×	×		×			×	×		
	White-back planthopper (*Sogota fureifera* Horv.)	××	××	××	×	×××	××	××	×××	×××	×××	×××
	Brown planthopper (*Nilaparvata lugens* Stal.)				×	×××	××	××	×××	×××	×××	×××
	Smaller brown planthopper (*Delphacodes striatella* Fallen)		×	×		×××	××	××	×	××	××	××
	Armyworm (*Sideridis unipuncta* Haw.)		×	×		×××	××	××		×	×	×
	Rice plant weevil (*Echinocnemus bipunctatus* Roel.)	×××	×	×	×			×		×	×	×
	Rice stem maggot (*Chlorops oryzae* Mats.)	×	×××	×××	××	×			××	×××	×××	××
	Rice leaf beetle (*Lema oryzae* Ku.)	×××	×××	×××	××		××		××	×××	×	
	Barley flea beetle (*Chaetocnema cylindrica* Baly)		×××	×××		××						
	Green rice leafhopper (*Nephotettix bipunctatus cincticeps* Uhl.)		××	××	×	×××	××	××	×	××	×××	×××
	Zigzag-striped leafhopper (*Deltocephalus dorsalis* Motsch.)						×	××		×		
	Black rice bug (*Scotinophara lurida* Burm.)				××	×	××	×××	×××	×××	××	×××
	Rice bug (*Leptocorisa varicornis* Fab.)					××	×	×	×	×	×	×
	Slender rice bug (*Cletus trigonus* Thunb.)							×		×		×
	Rice stink-bug (*Lagntomus assimulans* Dist.)					××	×	×		×		×××
	Rice plant skipper (*Pelopidas mathias oberthuri* Fab.)		×	×	××	×××	××	×××	×	×	×	××
	Mole cricket (*Gryllotalpa africana* Pal. de Beauv.)		×××	×××	×	×××				×		
	Rice green caterpillar (*Naranga aenescens* Moore)	×	×××	×××	××	×	××	××	××	×	××	××
	Rice leaf miner (*Agromyza oryzella* Mats.)	××	×××	×××	×							
	Smaller rice leaf miner (*Hydrellia griseola* Fallen)	×	×	×	×					×		
	Rice leaf roller (*Susumia exigua* Butler)		×	×	×		×	××		×	×	×
	Grass leaf roller (*Cnaphalocrocis medinalis* Guenee)								××	×	×	×××
	Rice crane fly (*Tipula aino* Alex.)	×			××	××			×	××		
	Rice caddice-fly (*Stetodes argentata* Mats.)	×××										

	Rice root worm (*Donacia provosti* Fair.)		×	×	××		××	××	×	×		
	Rice thrips (*Thrips oryzae* Wms.)					×	×	×	××	×	×	××
	Rice nematode	××				×	×		××			××
	Oligochaeta (*Oligochaeta limnodrilus*)	×	××	××		××			×	××		
	Grasshoppers (various)		×			×	××	××		××	×	×
WHEAT AND BARLEY	Rice crane fly (*Tipula aino* Alex.)		×	×	×	×××	×××	×××	××	×××	×	×
	English grain aphid (*Macro siphum granarium* Kirby)		×××	×××	×		×	×	××	×××	×	××
	Apple grain aphid (*Rhopalosiphum prunifoliae* Fitch)		×××	×××	×				××	××	××	××
	Corn leaf aphid (*Aphis maidis* Fitch)				×××							
	Aphids (various)	×			×	×××						
	Angoumous grain moth (*Sitotroga cerealella* Oliv.)	××	×	×	××	×××				×××		
	Wireworms (various)		××	××		×××	××	××			×	×
	Sweet potato wireworm (*Melanotus caudex* Lewis)	×××			×					××		
	Snowflea (*Onychiurus* Spp.)		×	×		××					××	×
	Yagi Snowflea (*Onychiurus yagii* Kino.)				×		×××	×××				
	Armyworm (*Sideridis unipuncta* Haw.)	××			×				××	×		××
	Beetles and Chafers (various)	××	××	××						××		
	Wheat leaf mite	×	×	×		××				×		
	Wheat blossom midge (*Sitodiplosis mosellana* Gehin)					××		×	×	××		
CORN	European corn borer (*Pyrausta nubilalis* Hubn.)		×××	×××								×
	Apple green aphid (*Rhopalosiphum prunifoliae* Fitch)		×	×					×	××		××
	Armyworm (*Sideridis unipuncta* Haw.)		××	××					××	××		
WHITE POTATO	Large 28-spotted lady beetle (*Epilachna vigintioctomaculata* Motsch.)	×××	×××	×××	×××	×××				×××	×	
	28-spotted lady beetle (*Epilachna sparsa orientalis* Dieke)					××	××	××		××	×	×
	Green peach aphid (*Myzus persicae* Sulzer)	××	×××	×××				×××	××	××	×	×
	Japanese potato aphid (*Aulacorthum matsumuraenum* Hori)	××	×××	×××	×					××		
	Sweet potato wireworm (*Melanotus caudex* Lewis)		×	×	×					××		
	Black cutworm (Greasy cutworm) (*Rhyacia ypsilon* Rott.)									×××		
	Turnip moth (Common cutworm) (Tobacco cutworm) (*Euxoa segetum* Schiff.)					××				×××	×	

NOTE: Ranging from × meaning relatively low to ××× meaning relatively high prevalence.

[*Continued next page*]

TABLE XVII—(Continued)
MAJOR INSECT PESTS OF FIELD AND ORCHARD CROPS IN AGRO-ECOLOGICAL REGIONS OF JAPAN

HOST CROP	INSECT PEST	Hokkaido	Pacific Side of Tohoku	Japan Sea Side of Tohoku	Hokuriku	Kanto	Tosan	Tokai	Inland Sea	Sanin	Northern Kyushu	Nankai
SWEET POTATO	Sweet potato leaf worm (*Anophia leucomelas* Linn.)					××	×××	×××	×××	×	××	×××
	Sweet potato leaf folder (*Pilocrocis tripunctata* Fab.)		××		×	×	××	××	××	×	×	×
	Palaearctic sweet potato hornworm (*Herse convolvuli* Linn.)		×				×	×	×	×	×	×
	Root knot nematode (*Heterodera marioni*)					×××						
	Leaf miner (various)										×	×××
SOYBEAN	Soybean pod gall midge (*Asphondylia ervi* Rubs.)				××	×××	×××	×××	×	××	×××	×××
	Soybean stem gall midge (*Profeltiella soya* Monz.)	×××	××				×	×		×		
	Soybean pod borer (*Cydia phaseoli* Mats.)	×××	×××	×××			×	×××	×	××		×
	Lima bean pod borer (*Eliella zinckenella* Treit.)				×	×××		×××	××	×××	××	××
	Two-striped leaf beetle (*Monolepta suturalis nigrobilineata* Motsch.)	××	×××	×××	×	××	××	××	××	××	××	××
	Soybean beetle (*Anomala rufocuprea* Motsch.)		××	××	×	×××	×××	×××	××	×	×	×
	False melon beetle (*Luperodes menetriesi* Fald.)	××	×××	×××	×		×	×		×		
	Japanese beetle (*Popillia japonica* Newman)	××	×	×	×		×	×			×	×
	Bean blister beetle (*Epicauta gorhami* Mars.)		×	×	×		××	××		××	×	×
	Bean leaf beetle (*Pagria signata* Motsch.)		×××	×××	×	××				×		
	Bean webworm (*Sylepta ruralis* Scop.)		×××	×××	××	××	×	×	×	××	×	××
	(*Lathronympha phaseoli* Mats.)		××	××		××	×		×××	××	×	××
	Bean bug (*Riptortus clavatus* Thunb.)		×	×	××		×××	×××	×××	××	×	××
	Green rice bug (*Nezara antennata* Scott)						×××	×××	×××	×	××	×××
	Unibanded stink-bug (*Piezodorus rubrofasciatus* Fab.)						×××	×××		××	×	
	Soybean root miner (*Ophiomyia*)	×	×××	×××	××						××	×××
	Soybean nematode	×××	×××	×××	××					××		
	Root knot nematode (*Heterodera marioni*)	×××				××						
	Soybean aphid (*Aphis glycines* Mats.)		×××	×××	×					×		
	Bean frosted weevil (*Eugnathus distinctus* Roel.)		××	××	×	××	×	×				
	Tobacco striped caterpillar (*Pyrrhia umbra* Huf.)	×××										

CITRUS	Arrowhead scale (*Prontaspis yanonensis* Kuwana)					×××		×××	×××	×××	×××	×××
	Ruby scale (Wax scale) (*Ceroplastes rubens* Mask.)					×××		×××	×××	×××		×××
	Cottony-cushion scale (*Icerya purchasi* Mask.)					××			××	××	×	××
	Citrus leaf miner (*Phyllocnistis citrella* Stain.)					×××				×		××
	Citrus spiny whitefly (*Aleurocanthus spiniferus* Quaint.)								××	××		×××
	White-spotted longicorn (*Melanauster chinensis* Foerst.)							×××	××			××
	Japanese red scale (*Aonidiella taxus* McK.)										××	×××
	Akebia leaf-like moth (*Adrias tyrannus* Guenee)							×××	××		×	××
	Citrus fruit fly (*Tetradacus tsuneonis* Miyaki)										×××	××
	Citrus mealy bug (*Pseudococcus citri* Risso)											×××
	Mites (various)					××		×××	××			
APPLE	Peach fruit moth (*Carposina sasakii* Mats.)	×××	××	×××						×××		
	Wooly apple aphid (*Eriosoma lanigerum* Haus.)	××		×			××		×××			
	Apple fruit moth (*Argyresthia conjugella* Zeller)	××					×××					
	Oriental fruit moth (*Grapholitha molesta* Busck)	××								×××		
	Oystershell scale (*Lepidosaphes ulmi* Linn.)	×××										
	White peach scale (Mulberry scale, West Indian peach scale, Catalpa scale) (*Sasakiaspis pentagona* Targ.-Tozz.)			×××								
	Apple blossom weevil (*Anthonomus pomorum* Linn.)		×××									
	Leaf rollers (various)	××		×××						×××		
PEAR	Oriental fruit moth (*Grapholitha molesta* Busck)	×××	×××	×××	×	×××	××	×××	×××	×××		
	Pear fruit moth	××	×××	×××				×××		×××	×	
	Peach fruit moth (*Carposina sasakii* Mats.)				×					×××	×××	
	Peach curculio (*Rhynchites heros* Roel.)	××						××		×××	××	
	Aphids (various)				×		××	××		××	×××	
	Pear lace bug (*Stephanitis nashi* Esaki et Takeya)		××	××		××		××	××	×	××	
	San Jose scale (Pernicious scale) (*Aspidiotus perniciosus* Comst.)					×××			×××	××		
	White peach scale (Mulberry scale, West Indian peach scale, Catalpa scale) (*Sasakiaspis pentagona* Targ.-Tozz.)		×××	×××								
	Pear sucker (*Psylla pyrisuga* Foers.)	×××	××	××						×××		
	Pear borer (*Chreonoma fortunei* Thomson)									×××	×	
	Leaf rollers (various)	××							××	×××	×	

NOTE: Ranging from × meaning relatively low to ××× meaning relatively high prevalence.

[*Continued next page*]

TABLE XVII—(Continued)
MAJOR INSECT PESTS OF FIELD AND ORCHARD CROPS IN AGRO-ECOLOGICAL REGIONS OF JAPAN

HOST CROP	INSECT PEST	Hokkaido	Pacific Side of Tohoku	Japan Sea Side of Tohoku	Hokuriku	Kanto	Tosan	Tokai	Inland Sea	Sanin	Northern Kyushu	Nankai
PEACH	Peach fruit moth (*Carposina sasakii* Mats.)		×××	×××				×××		×××	××	
	Oriental fruit moth (*Grapholitha molesta* Busck)							×××	×××	×××		
	(*Pycnormon latiferalis* Walker)					×××		×××	×××		×	
	Peach curculio (*Rhynchites heros* Roel.)					×	××	××	××	×××	××	
	Cherry tree borer (*Conopia hector* Butler)		×××	×××		×××	××	××				
	Mealy plum aphid (*Hyalopterus arundinis* Fab.)					×××				×	××	
PERSIMMON	Persimmon fruit moth					×××	×××	×××	×××	×××		××
	Ruby scale (*Ceroplastes rubens* Mask.)				×	×××	×××	××	×××	×××		×××
	Florida wax scale (*Ceroplastes floridensis* Coms.)							××	××			×
GRAPE	Grape phylloxera (*Phylloxera vitifoliae* Fitch)	×			×		×××	×××	×			
	Grape borer				×			×××	×××		×	
	Grape leafhopper (*Erythroneura apicalis* Mats.)				××			×××	××	××	×	
	Grape leaf beetle (*Colaspis brunnea* Fabr.)				××		×	××	××		××	
	Grape leaf worm	××						××		×××		
	Cupreous chafer (*Anomala cuprea* Hope)								××		×××	

Source: Based on Data from Ministry of Agriculture and Forestry, Japan.
NOTE: Ranging from × meaning relatively low to ××× meaning relatively high prevalence.

NORTH AMERICAN CLIMATIC ANALOGUES OF JAPAN

In terms of North American climatic regions, the heavy precipitation of Japan with its relatively large monthly totals throughout the greater part of the year, the absence of seasonal deficiency in rainfall, the general precipitation-distribution pattern over most of the country, and the high relative humidity of the atmosphere suggest some of the conditions prevailing over a number of Atlantic Coast areas of Canada and the United States. As can be seen from the agro-climatological chart of this study, the actual absolute monthly, seasonal, and annual totals of precipitation vary a great deal throughout Japan but as a whole they are considerably larger than those found in most of their latitudinal counterparts within the Atlantic Coast areas of North America even though the patterns of precipitation-distribution are often similar.

Except for the high altitude areas, ranges of the mean temperatures of the coldest and warmest months for the islands of Japan are as follows:

Range of Mean Temperatures in °F.		
Area	Coldest Month	Warmest Month
Hokkaido	13°-27°	63°-70°
Northern Honshu	25°-36°	72°-77°
Central Honshu	33°-45°	68°-82°
Southwestern Honshu	35°-45°	78°-82°
Shikoku	31°-46°	72°-83°
Kyushu	39°-46°	79°-83°

The summers of Japan, which are mostly hot and sultry, the cold winters of the northern part of Japan, the raw and chilling winters of a great many of the central and southwestern areas, and the warm and mild semi-tropical winters of some southernmost areas all find to a considerable extent their counterparts in North America. The highly diverse temperature regimes of the various regions and latitudes of Japan point to a great number of equally diverse climatic areas of North America, some of which are strikingly similar to the Japanese areas in their general pattern of thermal conditions.

The thermal conditions prevailing throughout the various areas of Japan when taken in conjunction with the high relative humidity of most of the country, the general trends in its precipitation-distribution pattern, and the wide extent of the latitudes of the country suggest some areas in the Maritime Provinces of Canada, and a great number of areas in the northern, central and southern regions of eastern United States. These regions appear to be subject to thermal conditions quite similar to those of Japan, and although there are differences in monthly, seasonal and annual totals of precipitation, these appear to be the most suitable and logical areas for year-round climatic analogues of Japan. These are almost the only regions in North America where both winter and summer temperatures parallel those of Japan in the same or like latitudes.

To a considerable degree they are similar to Japan in their year-round temperature conditions, in the length of frostless periods, in the total yearly and seasonal summations of day-degrees, in latitude ranges, and to some extent also in moisture conditions prevailing there. Accordingly, latitudinal and year-round thermal analogues within these North American regions most closely resembling the high-precipitation and high-humidity areas characteristic of Japan have been formulated for one hundred and fifty weather stations of Japan.[1] Such analogues in Nova Scotia, New Brunswick, Maine, Massachusetts, Rhode Island, Connecticut, New York, Maryland, West Virginia, Kentucky, North Carolina, Tennessee, South Carolina, Arkansas, Mississippi, Alabama, Georgia and Florida have been suggested in the agro-climatological chart and in the map of this study. The detailed listing of North American year-round thermal analogues of the various meteorological stations of Japan suggests also some of the major climatic differences between a given analogue and its "opposite number" in Japan.

The relatively mild winter conditions of Japan do not permit the formulation of year-round thermal analogues in a number of other areas of the United States where the latitudinal range and temperature conditions during the growing period and especially the total summation of day-degrees are fairly similar to those of Japan; but if attention be limited only to the temperature conditions prevailing in some summer-precipitation areas of North America during the growing period of the spring-planted, fall-harvested crops, the April-September fraction of the year, then the formulation of additional Japanese latitudinal and thermal analogues for spring-planted crops appears to be possible. Such analogues in Michigan, Wisconsin, Ohio, Missouri, Kentucky, West Virginia, Virginia, Arkansas, Texas, Colorado, New Mexico, Alabama, and Florida have been suggested and are listed in Table XVIII. This approach, ascertaining Japanese spring-crop latitudinal and thermal analogues within several United States areas of considerably lower summer precipitation and humidity, may be justified as a possible aid in solving some applied agronomic and horticultural problems in the introduction of spring crops.

The northwestern and Pacific regions of the United States provide some areas where the latitudinal range, thermal conditions, and especially total summation of day-degrees during autumn, winter, and early spring are not unlike those of a great number of areas of Japan. If attention is limited to the thermal conditions prevailing in some of these winter-precipitation areas of the United States during the October-April fraction of the year, that is, if one thinks only in terms of fall-planted and spring-harvested crops, the formulation of North American winter-crop, latitudinal and thermal analogues of Japan appears to be possible. Accordingly, latitudinal and thermal winter-crop analogues have been formulated

[1] Including three stations in the Ryukyu Islands.

for Japan in some of these North American winter-precipitation regions. Such analogues in a number of areas of Washington, Oregon, and California are listed in Table XVIII. From the agronomic and horticultural point of view one sometimes may be justified in looking upon these areas as possible potential sources of winter-crop seed for certain areas of Japan even though moisture conditions differ.

It must not be overlooked that, in the introduction of agricultural plants into Japan, the similarities of the physical environment of a given farm area of Japan and the American counterpart area are not the only criteria to be considered. The traditional land use pattern of Japan is often the result of highly potent economic considerations that cannot be ignored. In the selection of American plant material for introduction into Japan, not only must the physical environment of a given farm area be taken into account, but also the cropping sequence of Japan (Figure 16) with its frequently limited time allotment for the growing of certain crops. It should be noted also that the interchange of plant material between similar agro-ecological areas is not a one-way street, and that through a highly intensive study of micro-climatology, varietal adaptation, and special techniques, the Japanese agriculturists have learned and accomplished much that could have a valuable application in many other countries and in certain agricultural regions of the United States.

The data and material prepared for this study are merely pointers in the direction of comparative ecology with its vast agronomical and horticultural possibilities. It cannot be too strongly emphasized that some of the climatic conditions of Japan and of its North American counterparts, although comparable, are by no means identical. It must also be borne in mind that the data of each weather station reflect primarily local conditions in the immediate vicinity and permit no generalizations as to the often highly complex and dissimilar physical environment of some of the adjacent areas.

TABLE XVIII
NORTH AMERICAN LATITUDINAL AND THERMAL ANALOGUES OF JAPAN

Sta. Ref. No.*	JAPANESE METEOROLOGICAL STATION	YEAR-ROUND ANALOGUES Based on Yearly Summation of Day-Degrees	SPRING-CROP ANALOGUES Based on April-September Summation of Day-Degrees	WINTER-CROP ANALOGUES Based on October-April Summation of Day-Degrees
1	ABASHIRI	Nappan, Nova Scotia[1]	Newberry, Michigan	Stockdill's Ranch, Washington
2	ASAHIGAWA	Fredericton, New Brunswick[4]	Minocqua, Wisconsin	—— ——
3	ERIMO	Yarmouth, Nova Scotia[1,3]	Deer Park, Michigan	Sierraville, California
4	HABORO	Springfield, Nova Scotia	Plum Island, Wisconsin	Joseph, Oregon
5	HAKODATE	Plymouth, Massachusetts[1]	Manitowoc, Wisconsin	Alturas, California
6	KUSHIRO	Eastport, Maine[1]	Eagle Harbor, Michigan	Austin, Oregon
7	MURORAN	Portland, Maine[1]	Menominee, Michigan	Fish Lake, Oregon
8	NEMURO	Glace Bay, Nova Scotia[3]	Whitefish Point, Michigan	Joseph, Oregon
9	OBIHIRO	Saranac Lake, New York[1]	Sidnaw, Michigan	—— ——
10	SAPPORO	Roxbury, New York[1]	Port Washington, Wisconsin	Joseph, Oregon
11	SUTTSU	Kingston, Rhode Island[1]	Menominee, Michigan	Malin, Oregon
12	URAKAWA	Yarmouth, Nova Scotia[1,3]	Plum Island, Wisconsin	Malin, Oregon
13	WAKKANAI	Windsor, Nova Scotia[4]	Sturgeon Bay, Wisconsin	Winthrop, Washington
14	AOMORI	Kingston, Rhode Island[1,2]	Carsonville, Michigan	Alturas, California
15	MIYAKO	New London, Connecticut[1,2]	Green Hill, Ohio	Mount Shasta, California
16	MIZUSAWA	Brentwood, New York	Hiram, Ohio	Fort Bidwell, California
17	MORIOKA	Worcester, Massachusetts	Cleveland, Ohio	Sierraville, California
18	ISHINOMAKI	Atlantic City, New Jersey	Cleveland, Ohio	Greenville, California
19	SENDAI	Atlantic City, New Jersey	Bowling Green, Ohio	Greenville, California
20	AKITA	Cutchogue, New York[2]	Cleveland, Ohio	Burney, California
21	KAKUNODATE	South Orange, New Jersey[1,2]	Wellington, Ohio	Burney, California
22	KAMO	Cape May, New Jersey[2]	Findlay, Ohio	Downieville, California
23	YAMAGATA	Paterson, New Jersey	Defiance, Ohio	Burney, California
24	INAWASHIRO	Dover, New Jersey[1,2]	Millport, Ohio	Sierraville, California
25	FUKUSHIMA	Elizabeth, New Jersey[1]	Pataskala, Ohio	Deer Creek, California
26	KANAYAMA*	Atlantic City, New Jersey[2]	Bellefontaine, Ohio	Deer Creek, California
27	ONAHAMA	Montreat, North Carolina[1,2]	Cardington, Ohio	Weaverville, California
28	SHIRAKAWA	Darlington, Maryland[1,2]	Greenville, Ohio	Quincy, California
29	KAKIOKA	Jefferson, North Carolina[1,2]	Maryville, Missouri	Springville, California
30	ISHIOKA	Springdale, Tennessee[1]	Beattyville, Kentucky	Placerville, California
31	MITO	Rugby, Tennessee[1]	Marion, Virginia	Springville, California
32	SHIMODATE	Carthage, Tennessee[1]	Richmond, Kentucky	Placerville, California
33	TSUKUBASAN-CHO	Banners Elk, North Carolina[1]	Pickens, West Virginia	Burney, California
34	ASHIO	Linville, North Carolina[1,2]	Terre Alta, West Virginia	Burney, California
35	NIKKO	Highlands, North Carolina[1]	Dover, Ohio	Susanville, California
36	UTSUNOMIYA	Hendersonville, North Carolina[1]	Big Stone Gap, Virginia	Summerdale, California
37	MAEBASHI	Brevard, North Carolina[1,2]	Eubank, Kentucky	Lick Observatory, California
38	CHICHIBU	Rugby, Tennessee[1,2]	Farmers, Kentucky	Cuyamaca, California
39	KAWAGOE	Marion, North Carolina[1]	Bentonville, Arkansas	Placerville, California
40	KUMAGAYA	Brewers, North Carolina[1]	Williamstown, Kentucky	Tehachapi, California
41	TOKOROZAWA	Lenoir, North Carolina[1,2]	Williamstown, Kentucky	Idyllwild, California
42	URAWA	Marion, North Carolina[1]	Bergman, Arkansas	Placerville, California
43	CHOSHI	Dahlonega, Georgia[1]	Eubank, Kentucky	Llano, California
44	FUSA	Alpha, Kentucky[1]	Bergman, Arkansas	Independence, California
45	KATSUURA	Riverton, Alabama[1,2]	Nail, Arkansas	Haiwee, California
46	KISARAZU	Walhalla, South Carolina[1]	Gravette, Arkansas	Haiwee, California
47	MERA	Oneonta, Alabama[1,2]	Nail, Arkansas	Oakdale, California
48	SAKURA	Lynnville, Tennessee[1,2]	Bergman, Arkansas	Independence, California
49	SAWARA	Chimney Rock, North Carolina[1]	Tulia, Texas	Camptonville, California
50	OME	Rock House, North Carolina[1,3]	Maryville, Missouri	Cuyamaca, California
51	TOKYO	Roxboro, North Carolina[1,2]	Lieb, Texas	Placerville, California
52	CHIGASAKI	Clayton, Georgia[1]	Amarillo, Texas	Camptonville, California
53	YOKOHAMA	Clayton, Georgia[1]	Lieb, Texas	Mount Tamalpais, California
54	YOKOSUKA	Statesville, North Carolina[1,2]	Hannibal, Missouri	Atascadero, California
55	AIKAWA	Easton, Maryland	Maryville, Missouri	Ruth, California
56	HAMOCHI	Princess Anne, Maryland[1,2]	Kirksville, Missouri	Stirling City, California
57	NIIGATA	Lexington, Kentucky[1,2]	Maryville, Missouri	Springville, California
58	TAKADA	New Martinsville, West Virginia[1,2]	Grant City, Missouri	Montague, California
59	FUSHIKI	Greensburg, Kentucky[1,2]	Grant City, Missouri	Ruth, California
60	KANAZAWA	Beattyville, Kentucky[1,2]	Grant City, Missouri	Towle, California
61	MINAZUKI	Elkhorn, West Virginia[1,2]	Maryville, Missouri	West Branch, California
62	FUKUI	Nail, Arkansas[1,2]	Bethany, Missouri	Towle, California
63	OBAMA	Decatur, Tennessee[1,2]	Gravette, Arkansas	Hearst, California
64	TSURUGA	Tullahoma, Tennessee[1,2]	Darksville, Missouri	Hearst, California
65	OCHIAI (KAI)	Nothing comparable within the required latitudes	Cheesman, Colorado	Truckee, California
66	KOFU	Rugby, Tennessee[1,3]	Nail, Arkansas	Towle, California
67	IIDA	Brevard, North Carolina[1]	Maryville, Missouri	Yreka, California
68	KAMI-SUWA	Buckhannon, West Virginia[1]	Maryville, Missouri	Susanville, California
69	MATSUMOTO	Frostburg, Maryland	—— ——	Burney, California
70	NAGANO	Nuttallburg, West Virginia[1]	Maryville, Missouri	Susanville, California
71	OIWAKE	Nothing comparable within the required latitudes	Durango, Colorado	Truckee, California
72	GIFU	Clayton, Georgia[1]	Nail, Arkansas	Hearst, California
73	TAKAYAMA	Pickens, West Virginia[1,2]	Cope, Colorado	Fort Bidwell, California
74	ATAMI	Caroleen, North Carolina[1,2]	Nail, Arkansas	Haiwee, California
75	GOTEMBA	Rugby, Tennessee[1,2]	Maryville, Missouri	Springville, California

[1] Springtime mostly cooler; remainder of year mostly warmer. [2] Less precipitation. [3] More precipitation. [4] Cooler in summer and autumn.
*Refers to station number in Agro-Climatological Chart of this study, where coordinates, temperature, and precipitation data on these stations may be found.

TABLE XVIII—(Continued)
NORTH AMERICAN LATITUDINAL AND THERMAL ANALOGUES OF JAPAN

Sta. Ref. No.*	JAPANESE METEOROLOGICAL STATION	YEAR-ROUND ANALOGUES Based on Yearly Summation of Day-Degrees	SPRING-CROP ANALOGUES Based on April-September Summation of Day-Degrees	WINTER-CROP ANALOGUES Based on October-April Summation of Day-Degrees
76	HAMAMATSU	Mocksville, North Carolina[1]	Gravette, Arkansas	Haiwee, California
77	ITO	Savannah, Tennessee[1,2]	Bentonville, Arkansas	Haiwee, California
78	NAGATSURO	Holland, South Carolina[1]	Bergman, Arkansas	Fairmont, California
79	OKITSU	Chattanooga, Tennessee[1,2]	Bentonville, Arkansas	Santa Margarita, California
80	NUMAZU	Benton, Tennessee[1,2]	Bergman, Arkansas	Haiwee, California
81	NAGOYA	Marion, North Carolina[1,2]	Bergman, Arkansas	Placerville, California
82	KUWANA	Gainesville, Georgia[1,2]	Eureka Springs, Arkansas	Amago, California
83	MATSUZAKA	Smithfield, North Carolina[1,2]	Mount Nebo, Arkansas	Amago, California
84	TOBA	Edenton, North Carolina[1,2]	Lutherville, Arkansas	Turlock, California
85	TSU	Clayton, Georgia[1]	Bergman, Arkansas	Independence, California
86	HIKONE	Andrews, North Carolina[1]	Nail, Arkansas	Tehachapi, California
87	IBUKISAN	Nothing comparable within the required latitudes	Idaho Springs, Colorado	South Lake, California
88	AYABE	Clayton, Georgia[1]	Gravette, Arkansas	Placerville, California
89	KYOTO	Tullahoma, Tennessee[1,2]	Bergman, Arkansas	Towle, California
90	MAIZURU	Saxon, North Carolina[1,2]	Nail, Arkansas	Bishop, California
91	MIYAZU	Oak Ridge, North Carolina[1,2]	Nail, Arkansas	Tehachapi, California
92	OSAKA	Greenville, South Carolina[1,2]	Mount Nebo, Arkansas	Independence, California
93	HIMEJI	Greenville, South Carolina[1]	Mammoth Springs, Arkansas	Independence, California
94	KOBE	Greenville, South Carolina[1]	Bentonville, Arkansas	Mount Tamalpais, California
95	SUMOTO	Dahlonega, Georgia[1]	Bentonville, Arkansas	Mount Tamalpais, California
96	TOYOOKA	Rock House, North Carolina[1]	Grant City, Missouri	Bishop, California
97	ODAIGAHARAYAMA	Nothing comparable within the required latitudes	Westcliffe, Colorado	Lake Sebrina, California
98	YAGI	Tullahoma, Tennessee[1]	Bergman, Arkansas	Independence, California
99	HONGU	Hamilton, Alabama[1,2]	Hardy, Arkansas	Haiwee, California
100	SHINGU	Pontotoc, Mississippi[1,2]	Lacrosse, Arkansas	Santa Ana River, California
101	SHIONOMISAKI	Cordova, Alabama[1,2]	Bentonville, Arkansas	Santa Ana River, California
102	TANABE	St. Bernard, Alabama[1,2]	Lacrosse, Arkansas	Madera, California
103	WAKAYAMA	Tryon, North Carolina[1]	Mammoth Springs, Arkansas	Amago, California
104	KURAYOSHI	Oak Ridge, North Carolina[1,2]	Bergman, Arkansas	Independence, California
105	SAKAI	Roxboro, North Carolina[1,2]	Nail, Arkansas	Independence, California
106	TOTTORI	Benton, Tennessee[1,2]	Dodd City, Arkansas	Atascadero, California
107	YONAGO	Carthage ,Tennessee[1,2]	Bergman, Arkansas	Independence, California
108	HAMADA	Dahlonega, Georgia[1]	Mountain Grove, Missouri	Atascadero, California
109	MATSUE	Mocksville, North Carolina[1,2]	Bentonville, Arkansas	Magalia, California
110	TSUWANO	Brewers, North Carolina[1,2]	Bergman, Arkansas	Tehachapi, California
111	AJINO	Hickory, North Carolina[1]	Bentonville, Arkansas	Atascadero, California
112	OKAYAMA	Hot Springs, North Carolina[1]	Bentonville, Arkansas	Independence, California
113	HIROSHIMA	Tryon, North Carolina[1]	Bentonville, Arkansas	Independence, California
114	KABE	Andrews, North Carolina	Nail, Arkansas	Tehachapi, California
115	KURE	Greenville, South Carolina[1]	Bentonville, Arkansas	Atascadero, California
116	HAGI	Walhalla, South Carolina[1]	Mount Nebo, Arkansas	Amago, California
117	IWAKUNI	Spartanburg, South Carolina[1,2]	Dodd City, Arkansas	Amago, California
118	SHIMONOSEKI	Gainesville, Georgia[1,3]	Nail, Arkansas	Amago, California
119	HIWASA	Covington, Georgia[1,2]	Hardy, Arkansas	Fairmont, California
120	TOKUSHIMA	Dahlonega, Georgia[1]	Rogers, Arkansas	Haiwee, California
121	KOTOHIRA	Holly Springs, Mississippi[1,2]	Mammoth Springs, Arkansas	Independence, California
122	MARUGAME	Valley Head, Alabama[1,3]	Gravette, Arkansas	Oak Grove, California
123	TADOTSU	Riverton, Alabama[1,3]	Gravette, Arkansas	Oak Grove, California
124	MATSUYAMA	Gainesville, Georgia[1]	Gravette, Arkansas	Atascadero, California
125	NIIHAMA	Walhalla, South Carolina[1]	Rogers, Arkansas	Haiwee, California
126	SHISAKAJIMA	Clemson College, South Carolina[1,3]	Nail, Arkansas	Llano, California
127	TONARU	Highlands, North Carolina[4]	Taylor, New Mexico	Quincy, California
128	UWAJIMA	Rome, Georgia[1,2]	Rogers, Arkansas	Haiwee, California
129	YAWATAHAMA	Athens, Georgia[1,2]	Lutherville, Arkansas	Fairmont, California
130	AKI	Gillsville, Georgia[1,2]	Hardy, Arkansas	Fairmont, California
131	ASHIZURIZAKI	Pontotoc, Mississippi[1,2]	Lutherville, Arkansas	Pomona, California
132	KOCHI	Ripley, Mississippi[1,2]	Mammoth Springs, Arkansas	Haiwee, California
133	MUROTO	Atlanta, Georgia[1,2]	Gravette, Arkansas	Warner Springs, California
134	FUKUOKA	Diamond, Georgia[1,3]	Gravette, Arkansas	Amago, California
135	KURUME	Tallapoosa, Georgia[2]	Bentonville, Arkansas	Haiwee, California
136	SAGA	Ramhurst, Georgia[1,2]	Dodd City, Arkansas	Amago, California
137	IZUHARA	Dahlonega, Georgia[1,2]	Nail, Arkansas	Amago, California
138	NAGASAKI	Gore, Georgia[2]	Bentonville, Arkansas	Haiwee, California
139	SASEBO	Lost Mountain, Georgia[1,2]	Dodd City, Arkansas	Haiwee, California
140	TOMIE	Athens, Georgia[1,2]	Mount Nebo, Arkansas	Warner Springs, California
141	UNZENDAKE	Parker, North Carolina[2,4]	Estancia, New Mexico	Squirrel Inn, California
142	KUMAMOTO	Gainesville, Georgia[2]	Dodd City, Arkansas	Amago, California
143	OITA	Diamond, Georgia[1]	Bergman, Arkansas	Amago, California
144	MIYAKONOJO	Florence, Alabama[2]	Valley Head, Alabama	Haiwee, California
145	MIYAZAKI	Decatur, Alabama[2]	Oneonta, Alabama	Warner Springs, California
146	KAGOSHIMA	Hamilton, Alabama[2]	Oneonta, Alabama	Warner Springs, California
147	MAKURAZAKI	Rock Mills, Alabama[2]	Albertville, Alabama	See Year-Round Analogues
148	NAZE	New Smyrna, Florida[2]	De Funiak Springs, Florida	Palm Springs, California
149	ISHIGAKI	Fort Pierce, Florida[2]	Fort Pierce, Florida	See Year-Round Analogues
150	NAHA	Avon Park, Florida[2]	Bradenton, Florida	See Year-Round Analogues

[1] Springtime mostly cooler; remainder of year mostly warmer. [2] Less precipitation. [3] More precipitation. [4] Cooler in summer and autumn.
*Refers to station reference number in Agro-Climatological Chart of this study, where coordinates, temperature, and precipitation data on these stations may be found.

KEY TO NAMES OF METEOROLOGICAL STATIONS PLOTTED ON MAPS AND AREAS OF THEIR THERMAL AND LATITUDINAL ANALOGUES IN NORTH AMERICA

HOKKAIDŌ*

SHICHŌ	
ABASHIRI	
1. Abashiri	Nova Scotia
ASAHIGAWA	
2. Asahigawa	New Brunswick
HIDAKA	
3. Erimo	Nova Scotia
RUMOI	
4. Haboro	" "
HAKODATE	
5. Hakodate	Massachusetts
KUSHIRO	
6. Kushiro	Maine
MURORAN	
7. Muroran	"
NEMURO	
8. Nemuro	Nova Scotia
OBIHIRO	
9. Obihiro	New York
SAPPORO	
10. Sapporo	" "
SHIRIBESHI	
11. Suttsu	Rhode Island
HIDAKA	
12. Urakawa	Nova Scotia
SŌYA	
13. Wakkanai	" "

PREFECTURES

HONSHŪ

AOMORI	
14. Aomori	Rhode Island
IWATE	
15. Miyako	Connecticut
16. Mizusawa	New York
17. Morioka	Massachusetts
MIYAGI	
18. Ishinomaki	New Jersay
19. Sendai	" "
AKITA	
20. Akita	New York
21. Kakunodate	New Jersey
YAMAGATA	
22. Kamo	" "
23. Yamagata	" "
FUKUSHIMA	
24. Inawashiro	" "
25. Fukushima	" "
**26. Kanayama	" "
27. Onahama	North Carolina
28. Shirakawa	Maryland
IBARAKI	
29. Kakioka	North Carolina
30. Ishioka	Tennessee
31. Mito	"
32. Shimodate	"
33. Tsukubasan	North Carolina
TOCHIGI	
34. Aabio	" "
35. Hikkō	" "
36. Utsunomiya	" "
GUNMA	
37. Maebashi	" "
SAITAMA	
38. Chichibu	Tennessee
39. Kawagoe	North Carolina
40. Kumagaya	" "
41. Tokorozawa	" "
42. Urawa	" "
CHIBA	
43. Chōsbi	Georgia
44. Fusa	Kentucky
45. Katsuura	Alabama
46. Kisarazu	South Carolina
47. Mera	Alabama
48. Sakura	Tennessae
49. Sawara	North Carolina
TŌKYŌ	
50. Ōme	" "
51. Tōkyō	" "
KANGAWA	
52. Chigasaki	Georgia
53. Yokohama	"
54. Yokosuka	North Carolina
NIIGATA	
55. Aikawa	Maryland
56. Hamochi	"
57. Niigata	Kentucky
58. Takada	West Virginia
TOYAMA	
59. Fushiki	Kentucky
ISHIKAWA	
60. Kanazawa	"
61. Minazuki	West Virginia
FUKUI	
62. Fukui	Arkansas
63. Obama	Tennessee
64. Tsuruga	"
YAMANASHI	
65. Ōchiai(Kai)	No Analogue Available
66. Kōfu	Tennessee
NAGANO	
67. Iida	North Carolina
68. Kami-Suwa	West Virginia
69. Matsumoto	Maryland
70. Nagano	West Virginia
71. Oiwake	No Analogue Available
GIFU	
72. Gifu	Georgia
73. Takayama	West Virginia
SHIZUOKA	
74. Atami	North Carolina
75. Gotemba	Tennessee
76. Hamamatsu	North Carolina
77. Itō	Tennessee
78. Nagatsuro	South Carolina
79. Okitsu	Tennessee
80. Numazu	
AICHI	
81. Nagoya	North Carolina
MIE	
82. Kuwana	Georgia
83. Matsuzaka	North Carolina
84. Toba	" "
85. Tsu	Georgia
SHIGA	
86. Hikone	North Carolina
87. Ibukisan	No Analogue Available
KYOTO	
88. Ayabe	Georgia
89. Kyoto	Tennessee
90. Maizuru	North Carolina
91. Miyazu	" "
OSAKA	
92. Osaka	South Carolina
HYOTO	
93. Himeji	" "
94. Kobe	" "
95. Sumoto	Georgia
96. Toyooka	North Carolina
NARA	
97. Odaigahara	No Analogue Available
98. Yagi	Tennessee
WAKAYAMA	
99. Hongū	Alabama
100. Sbingū	Mississippi
101. Sbionomiaaki	Alabama
102. Tanabe	"
103. Wakayama	North Carolina
TOTTORI	
104. Kurayoshi	" "
105. Sakai	" "
106. Tottori	Tennessee
107. Yonago	"
SHIMANE	
108. Hamada	Georgia
109. Matsue	North Carolina
110. Tsuwano	" "
OKAYAMA	
111. Ajino	" "
112. Okayama	" "
HIROSHIMA	
113. Hiroahima	" "
114. Kabe	" "
115. Kure	South Carolina
YAMAGUCHI	
116. Hagi	" "
117. Iwakuni	" "
118. Shimonoseki	Georgia
TOKUSHIMA	
119. Hiwasa	Georgia
120. Tokushima	"
KAGAWA	
121. Kotohira	Mississippi
122. Marugame	Alabama
123. Tadotsu	"
EHIME	
124. Matsuyama	Georgia
125. Niihama	South Carolina
126. Shisakajima	" "
127. Tōnaru	North Carolina
128. Uwajima	Georgia
129. Yawatahama	"
KOCHI	
130. Aki	"
131. Ashizurizaki	Mississippi .
132. Kochi	"
133. Muroto	Georgia

KYUSHU

FUKUOKA	
134. Fukuoka	Georgia
135. Kurume	"
SAGA	
136. Saga	"
NAGASAKI	
137. Izubara	"
138. Nagasaki	"
139. Sasebo	"
140. Tomie	"
141. Unzendake	North Carolina
KUMAMOTO	
142. Kumamoto	Georgia
ŌITA	
143. Oita	"
MIYAZAKI	
144. Miyakonojo	Alabama
145. Miyazaki	"
KAGOSHIMA	
146. Kagosbima	"
147. Makurazaki	"

*Island prefecture of Hokkaido is divided into subprefectures or Shichō.

**Station No. 26.-Kanayama, should have been listed under Miyagi prefecture in Igu-gun (following Station No. 18)

Figure 22

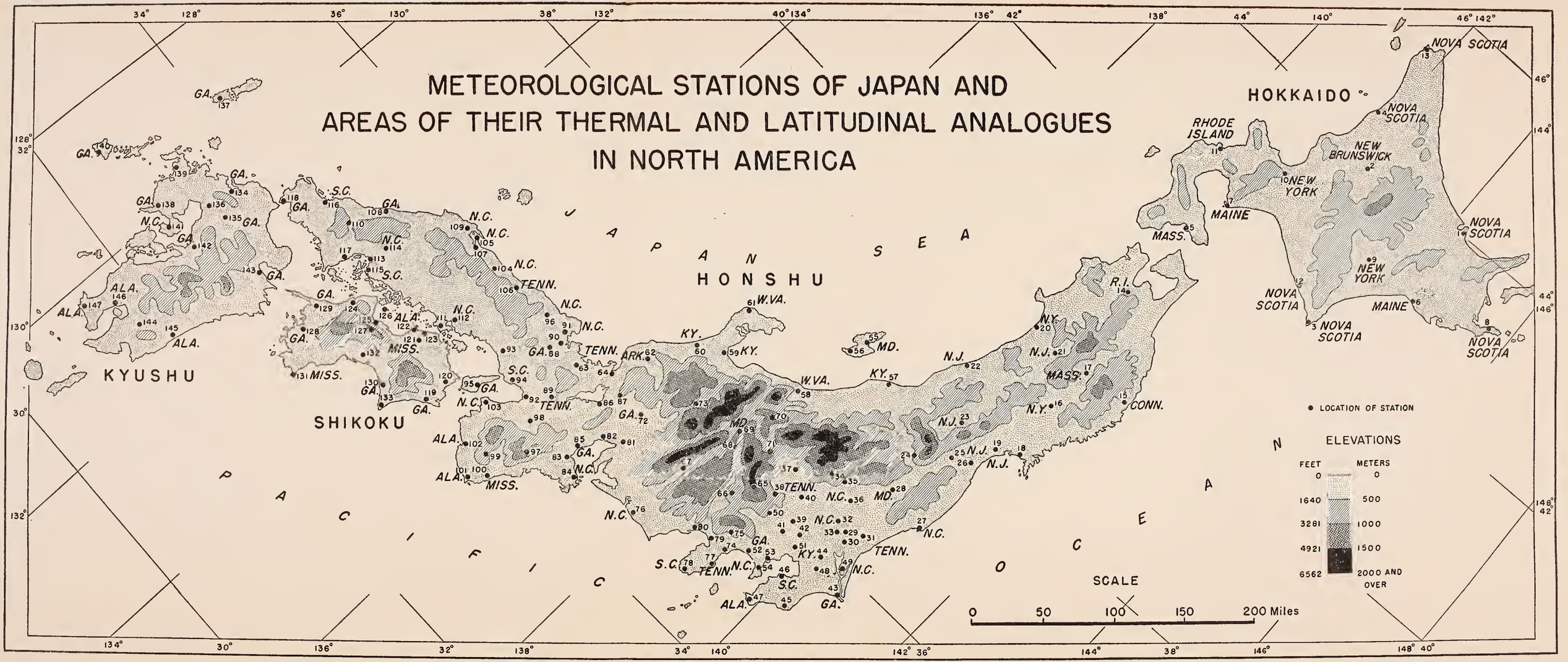

METEOROLOGICAL STATIONS OF JAPAN AND
AREAS OF THEIR THERMAL AND LATITUDINAL ANALOGUES
IN NORTH AMERICA
HOKKAIDO
HONSHU
KYUSHU
SHIKOKU
JAPAN SEA
PACIFIC OCEAN
NOVA SCOTIA
RHODE ISLAND
NEW BRUNSWICK
NEW YORK
MAINE
MASS.
R.I.
CONN.
N.J.
N.Y.
MD.
W.VA.
KY.
TENN.
N.C.
S.C.
GA.
ALA.
MISS.
ARK.
LOCATION OF STATION
ELEVATIONS
FEET
METERS
0
1640
3281
4921
6562
500
1000
1500
2000 AND OVER
SCALE
0 50 100 150 200 Miles

Figure 22

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AGRO-CLIMATOLOGICAL CHART OF JAPAN AND ITS NORTH AMERICAN CLIMATIC ANALOGUES —I

(Based upon monthly and annual meteorological data)

Major Island	Prefecture	Shi or Gun	Meteorological Station	Station Ref. No.	Latitude (N.)	Longitude (E.)	Altitude (Feet)	Length of Record (Years)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Annual Range
									MEAN TEMPERATURES (° F.)													
HOKKAIDŌ	HOKKAIDŌ	Abashiri-gun	ABASHIRI	1	44°01′	144°17′	128	45	19.4	18.7	26.4	37.9	46.8	54.3	62.6	66.7	80.3	49.8	37.4	25.9	42.3	48.0
		Asahigawa-shi	ASAHIGAWA	2	43°47′	142°22′	370	45	14.2	16.3	25.2	38.8	50.5	60.3	67.8	69.3	59.2	46.0	34.2	21.7	42.1	55.1
		Hidaka-shichō, Horoizumi-gun	ERIMO	3	41°55′	143°15′	210	40	27.0	27.3	30.9	38.3	44.6	51.4	59.2	64.9	02.1	53.8	43.0	31.5	44.6	37.9
		Rumoi shichō, Tomamae-gun	HABOHO	4	44°23′	141°42′	69	9	21.0	22.1	28.0	39.9	48.0	57.0	66.2	69.3	62.2	51.3	38.8	28.2	44.4	48.3
		Hakodate-shi	HAKODATE	5	41°17′	140°43′	10	45	26.4	27.5	33.4	43.2	50.9	58.3	66.4	70.9	64.4	53.6	42.1	31.3	47.5	44.5
		Kushiro-shi	KUSHIRO	6	42°59′	144°24′	111	30	19.8	20.1	27.5	37.0	44.1	51.1	59.5	64.0	59.2	49.5	38.3	26.2	41.4	44.2
		Muroran-shi	MURORAN	7	42°20′	140°57′	66	7	26.6	26.6	31.8	41.2	48.7	55.0	67.1	70.5	65.1	54.5	43.2	32.0	46.9	43.9
		Nemuro-shichō, Nemuro-gun	NEMURO	8	43°20′	145°35′	88	45	22.8	21.6	27.9	36.9	43.5	49.6	57.6	62.8	59.5	51.4	40.3	29.1	41.9	41.2
		Obihiro-shi	OBIHIRO	9	42°55′	143°12′	134	45	13.3	15.3	25.9	39.4	49.5	57.2	64.8	67.5	59.4	47.7	35.1	21.4	41.4	54.2
		Sapporo-shi	SAPPORO	10	43°04′	141°21′	56	45	20.8	22.8	29.5	41.4	50.9	59.0	66.9	70.0	61.7	49.6	37.9	26.2	44.8	49.2
		Shiribeshi-shichō, Suttsu-gun	SUTTSU	11	42°48′	140°13′	55	30	26.2	27.5	31.8	42.1	50.0	57.2	65.1	69.8	63.7	52.9	40.8	30.0	46.4	43.6
		Hidaka-shichō, Urakawa-gun	URAKAWA	12	42°09′	142°47′	115	3	25.5	24.3	31.3	39.7	46.6	53.2	64.9	69.1	63.5	54.3	43.0	31.8	45.7	44.8
		Sōya-shichō, Sōya-gun	WAKKANAI	13	45°25′	141°40′	.....	10	20.8	21.6	27.7	39.6	47.7	56.5	64.0	68.9	63.0	52.3	37.8	28.0	43.9	48.1
HONSHŪ	AOMORI	Aomori-shi	AOMORI	14	40°50′	140°45′	43	45	27.0	27.7	33.1	44.1	53.2	61.3	69.3	73.9	65.1	54.8	42.4	32.0	48.6	46.9
	IWATE	Miyako-shi	MIYAKO	15	39°38′	141°59′	100	45	30.8	31.1	36.5	48.6	54.1	61.0	68.5	72.0	65.5	55.0	45.1	35.6	50.2	41.4
		Isawa-gun	MIZUSAWA	16	39°08′	141°08′	208	24	27.0	28.2	34.3	46.9	55.6	63.7	71.8	73.9	65.7	53.8	42.8	32.0	49.6	46.9
		Morioka-shi	MORIOKA	17	39°42′	141°10′	416	6	25.5	26.1	32.0	45.9	55.2	62.4	72.1	73.4	64.9	52.0	42.1	31.6	48.6	47.9
	MIYAGI	Ishinomaki-shi	ISHINOMAKI	18	38°26′	141°19′	148	45	31.1	32.2	37.4	47.3	55.4	63.0	70.3	73.9	67.5	56.8	46.2	36.0	51.4	42.8
		Sendai-shi	SENDAI	19	38°16′	140°54′	131	3	31.1	30.7	37.0	47.8	56.1	62.8	72.7	74.8	67.3	57.4	47.1	37.0	51.8	44.1
	AKITA	Akita-shi	AKITA	20	39°43′	140°06′	33	45	29.3	29.5	35.4	46.6	55.6	64.6	72.1	75.0	66.6	55.0	44.4	34.3	50.7	45.7
		Semboku-gun	KAKUNODATE	21	39°36′	140°34′	.....	7	27.8	29.1	33.3	47.7	56.5	85.7	74.1	76.6	68.0	55.6	44.2	32.2	50.7	48.8
	YAMAGATA	Nishi-tagawa-gun	KAMO	22	38°44′	139°41′	41	19	35.8	35.2	39.6	49.8	57.4	66.0	73.6	76.3	69.1	59.0	49.1	39.6	54.1	41.1
		Yamagata-shi	YAMAGATA	23	38°15′	140°21′	509	45	28.8	29.5	35.6	47.7	57.7	66.4	73.8	75.4	66.9	54.7	43.5	33.8	51.1	46.6
	FUKUSHIMA	Yama-gun	INAWASHIRO	24	37°34′	140°07′	1740	6	26.4	26.4	31.1	45.1	54.9	63.0	72.1	73.0	65.1	52.7	42.6	32.9	48.7	46.6
		Fukushima-shi	FUKUSHIMA	25	37°45′	140°24′	203	30	33.1	33.8	38.8	50.4	58.8	66.4	73.6	75.6	68.0	56.5	46.2	37.2	53.2	42.5
		Igu-gun	KANAYAMA*	26	37°53′	140°46′	74	27	33.1	33.8	38.5	49.3	57.4	64.6	71.8	73.9	67.1	56.1	45.9	37.2	52.3	40.1
		Iwaki-gun	ONAHAMA	27	36°56′	140°54′	20	19	36.3	37.2	41.0	50.4	57.0	63.1	70.3	74.5	69.6	59.5	50.2	41.0	54.3	38.2
		Nishi-shirakawa-gun	SHIRAKAWA	28	37°08′	140°13′	1140	10	31.3	32.7	37.4	49.6	57.0	64.9	73.4	75.9	67.8	56.3	45.9	36.0	52.3	44.6
	IBARAKI	Niihari-gun	KAKIOKA	29	36°14′	140°11′	98	6	34.3	34.7	39.7	51.6	59.4	65.5	74.8	77.3	69.6	58.1	48.0	39.7	54.3	43.0
		Niihari-gun	ISHIOKA	30	36°11′	140°16′	.....	10	36.7	38.5	43.3	54.0	61.0	67.8	76.8	78.6	72.9	61.0	50.5	41.2	56.8	41.9
		Mito-shi	MITO	31	36°23′	140°28′	102	30	35.6	37.0	41.9	52.0	59.5	66.2	73.0	75.7	69.8	59.2	48.9	39.4	54.9	40.1
		Makabe-gun	SHIMODATE	32	36°18′	139°59′	.....	10	36.0	38.1	43.2	55.4	62.4	68.9	77.5	80.2	72.9	61.5	51.3	40.6	57.4	44.2
		Tsukuba-gun	TSUKUBASAN-CHO	33	36°13′	140°06′	2854	28	29.8	29.8	34.7	45.7	52.7	59.7	67.1	68.5	62.4	52.7	44.1	34.9	48.6	38.7
	TOCHIGI	Kami-tsuga-gun	ASHIO	34	36°39′	139°27′	2211	31	29.7	30.4	36.0	47.5	54.7	61.9	68.9	70.5	64.2	53.6	43.7	34.5	49.6	40.8
		Kami-tsuga-gun	NIKKŌ	35	36°45′	139°36′	2013	7	30.9	31.8	37.0	49.3	56.3	63.1	71.2	72.9	67.5	54.9	45.5	36.0	51.3	42.0
		Utsunomiya-shi	UTSUNOMIYA	36	36°34′	139°54′	410	30	33.6	35.2	40.8	52.0	59.9	67.3	73.9	76.1	69.3	58.1	47.1	37.2	54.1	42.5
	GUMMA	Maebashi-shi	MAEBASHI	37	36°24′	139°04′	371	30	36.0	37.2	42.4	53.1	60.4	68.0	74.8	76.6	69.6	58.8	49.1	39.1	55.6	40.6
	SAITAMA	Chichibu-gun	CHICHIBU	38	35°59′	139°05′	794	3	33.1	33.3	40.5	53.4	60.6	67.3	76.1	76.1	68.7	58.5	48.2	39.6	54.7	43.0
		Kawagoe-shi	KAWAGOE	39	35°55′	139°29′	78	10	37.0	39.4	44.6	55.9	62.8	70.3	79.2	80.6	73.4	61.9	51.4	41.2	58.1	43.6
		Kumagaya-shi	KUMAGAYA	40	36°09′	139°23′	105	30	36.1	37.8	43.0	53.6	61.2	88.7	75.6	77.4	70.5	59.4	49.1	39.9	55.0	41.3
		Iruma-gun	TOKOROZAWA	41	35°48′	139°28′	236	18	34.5	36.5	41.7	52.7	60.1	67.5	75.4	76.8	70.2	59.0	48.7	38.8	55.2	42.3
		Urawa-shi	URAWA	42	35°51′	139°39′	.....	10	36.9	38.8	43.9	55.2	61.7	69.3	77.5	79.5	73.2	61.3	51.4	41.4	57.6	42.6
	CHIBA	Chōshi-shi	CHŌSHI	43	35°44′	140°51′	64	45	41.4	41.9	46.6	54.9	61.0	66.6	72.7	76.5	72.5	64.4	55.8	46.2	58.5	35.1
		Higashi-katsushika-gun	FUSA	44	35°51′	140°08′	.....	10	37.9	41.2	45.3	56.5	62.6	68.9	77.0	79.3	73.6	62.6	53.1	42.8	58.5	41.4
		Isumi-gun	KATSUURA	45	35°09′	140°19′	44	18	41.9	42.8	47.1	56.8	62.4	67.8	74.7	78.1	73.9	63.9	55.9	48.4	59.4	36.2
		Kisarazu-shi	KISARAZU	46	35°23′	139°55′	.....	10	40.5	41.2	46.4	56.5	63.3	68.7	78.3	80.4	75.6	64.8	54.7	44.8	59.5	39.9
		Awa-gun	MERA	47	34°55′	139°50′	43	8	43.0	43.7	47.7	56.8	63.0	68.4	74.7	78.1	73.6	64.2	56.8	48.9	59.9	35.1
		Imba-gun	SAKURA	48	35°43′	140°14′	.....	10	38.1	39.9	53.8	55.6	62.2	68.9	77.9	78.4	74.5	63.0	53.4	42.6	58.3	40.3
		Katori-gun	SAWARA	49	35°43′	140°30′	.....	10	38.7	40.6	44.8	55.9	62.1	68.4	77.2	79.3	74.3	62.8	52.2	43.2	58.3	40.6
	TŌKYŌ	Nishi-tama-gun	ŌME	50	35°47′	139°15′	066	15	34.5	35.8	40.5	51.8	59.0	66.2	74.3	75.2	69.4	58.8	48.9	39.2	54.5	40.7
		Tōkyō-to	TŌKYŌ	51	35°41′	139°46′	19	45	37.6	38.8	44.6	54.7	62.2	69.1	76.1	78.3	71.8	61.2	51.3	41.5	57.2	40.7
	KANAGAWA	Koza-gun	CHIGASAKI	52	35°19′	139°23′	36	26	38.7	40.5	45.1	55.4	62.1	68.7	75.6	77.7	71.6	61.3	52.0	42.3	57.6	39.0
		Yokohama-shi	YOKOHAMA	53	35°26′	139°39′	125	30	39.2	40.3	45.1	55.2	62.0	69.1	76.5	78.3	72.3	61.9	52.3	43.5	57.9	39.1
		Yokosuka-shi	YOKOSUKA	54	35°17′	139°40′	38	30	40.5	40.8	45.7	55.4	62.1	68.4	74.8	77.4	72.0	62.1	53.4	45.1	58.1	36.9
	NIIGATA	Sado-gun	AIKAWA	55	38°02′	138°14′	148	8	36.0	36.5	40.1	50.0	57.6	66.0	74.3	77.9	71.1	60.8	50.9	41.4	55.2	41.9
		Sado-gun	HAMOCHI	56	37°51′	138°19′	.....	10	35.8	36.9	41.0	51.6	59.5	68.0	76.5	79.2	72.5	61.5	50.9	41.2	56.1	43.4
		Niigata-shi	NIIGATA	57	37°55′	139°03′	84	30	34.7	34.9	39.7	50.4	58.1	66.9	74.5	77.7	70.3	59.4	48.9	39.2	54.7	43.0
		Takada-shi	TAKADA	58	37°06′	138°15′	49	8	33.3	34.0	37.8	50.0	59.7	67.5	76.6	79.2	71.1	58.8	49.5	39.4	54.7	45.9
	TOYAMA	Takaoka-shi	FUSHIKI	59	36°47′	137°03′	44	30	36.1	36.1	41.2	50.9	59.2	67.5	75.4	78.3	71.1	60.1	49.8	40.3	55.6	42.2
	ISHIKAWA	Kanazawa-shi	KANAZAWA	60	36°32′	136°39′	94	30	36.9	36.7	41.5	50.0	60.1	67.8	75.2	77.7	70.5	59.7	50.2	41.2	55.9	41.0
		Fugeshi-gun	MINAZUKI	61	37°22′	136°45′	531	7	34.3	35.1	39.4	50.2	58.6	65.5	73.8	77.5	70.9	60.1	50.3	40.1	54.7	43.2
	FUKUI	Fukui-shi	FUKUI	62	36°03′	136°16′	35	30	36.6	36.7	42.1	52.9	61.3	69.1	76.6	78.6	70.9	59.4	49.8	40.6	56.1	43.3
		Onyū-gun	OBAMA	63	35°31′	135°45′	.....	10	37.9	39.0	43.2	54.9	62.4	70.2	79.7	81.0	74.3	62.4	53.2	43.7	58.5	43.1
		Tsuruga-shi	TSURUGA	64	35°38′	136°03′	29	45	38.5	38.3	43.5	53.1	61.2	69.1	76.8	78.8	71.8	61.3	52.2	43.5	57.4	40.5
	YAMANASHI	Naka-koma-gun	ŌCHIAI (KAI)	65	35°48′	138°49′	3687	15	24.8	26.1	31.3	42.8	50.0	57.7	65.5	66.0	60.4	49.1	39.4	30.2	45.3	41.2
		Kōfu-shi	KŌFU	66	35°38′	138°34′	853	45	34.2	36.7	44.1	55.0	62.1	69.8	77.2	77.9	71.1	59.4	48.4	38.5	56.1	43.7
	NAGANO	Iida-shi	IIDA	67	35°31′	137°50′	1567	45	31.8	33.1	40.1	51.4	59.4	67.1	74.3	75.2	67.1	56.3	45.5	36.7	53.2	43.4
		Suwa-gun	KAMI-SUWA	68	36°02′	138°07′	2300	10	28.4	30.4	37.0	50.7	58.3	66.4	74.3	75.4	68.4	55.0	44.6	34.3	52.0	47.0
		Matsumoto-shi	MATSUMOTO	69	36°14′	137°59′	1909	45	28.2	28.9	36.3	48.4	57.4	65.8	73.0	73.6	65.8	53.8	43.2	34.0	50.7	45.4
		Nagano-shi	NAGANO	70	36°40′	138°12′	1378	45	28.6	29.8	36.7	48.9	58.1	66.6	74.1	75.7	67.5	55.6	44.4	34.2	51.6	47.1
		Kita-saku-gun	OIWAKE	71	36°20′	138°33′	3302	4	24.3	23.5	29.7	42.3	51.6	58.1	67.6	68.2	60.8	49.3	38.8	30.4	45.3	44.7
	GIFU	Gifu-shi	GIFU	72	35°24′	136°46′	48	45	37.0	38.3	44.2	54.5	82.8	70.5	78.1	79.3	72.3	61.3	50.9	41.7	57.6	42.3
		Takayama-shi	TAKAYAMA	73	36°09′	137°15′	1839	45	28.8	25.7	34.9	47.1	56.5	64.9	72.1	73.4	67.8	53.6	42.3	32.7	50.0	47.7
	SHIZUOKA	Atami-shi	ATAMI	74	35°06′	139°04′	.....	10	42.4	43.0	46.8	56.7	62.4	68.5	76.5	77.9	73.6	63.9	55.8	46.9	59.5	35.5
		Sunto-gun	GOTEMBA	75	35°18′	138°56′	1300	10	36.8	37.6	41.9	52.7	59.0	66.0	73.4	75.2	70.2	59.4	49.8	40.5	55.0	38.6

Station Ref. No.	Absolute Temp. (° F.) Max.	Absolute Temp. (° F.) Min.	Killing Frost Average Dates: Last in Spring	Killing Frost Average Dates: First in Fall	Duration of Average Frostless Season (Days)	Length of Record (Years)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Precipitation Effectivity Index	Length of Record (Years)
							AVERAGE PRECIPITATION (Inches)														
1	96.8	-20.6	May 28	Oct. 7	131	45	2.7	1.7	2.4	2.0	2.5	2.5	3.5	3.8	4.7	3.0	2.7	2.2	33.7	96.4	30
2	96.6	-41.3	May 27	Sept. 2	97	45	2.9	2.2	2.1	2.0	2.6	3.1	4.6	4.9	5.7	4.3	4.4	4.1	42.9	127.2	30
3	85.3	-4.4	.....	.....	.....	40	1.0	0.8	1.5	2.6	3.2	3.3	3.9	3.8	4.7	4.2	2.9	2.1	34.0	82.9	30
4	91.2	-15.5	May 12	Oct. 25	165	9	3.8	2.4	2.0	2.1	3.2	2.2	4.6	4.6	6.1	6.7	8.3	4.9	48.9	146.3	9
5	92.3	-7.1	May 14	Oct. 14	152	45	2.7	2.5	2.6	2.7	3.4	3.5	5.4	5.1	8.8	4.6	4.2	3.3	40.8	120.4	30
6	96.8	-18.9	May 22	Oct. 11	141	20	2.0	1.4	2.6	3.5	3.7	4.4	4.5	5.5	8.0	4.6	2.9	2.0	43.1	119.0	20
7	91.0	8.1	Apr. 23	Oct. 11	170	7	2.2	1.7	2.1	2.0	3.7	3.1	4.6	6.5	5.7	4.8	3.9	3.5	43.6	108.2	7
8	89.8	-8.9	May 27	Oct. 9	134	45	1.6	1.3	2.6	3.1	3.7	3.7	4.1	4.1	5.8	4.3	3.5	2.2	40.0	110.3	30
9	100.0	-36.8	May 27	Sept. 26	121	45	1.4	1.4	2.3	2.5	3.3	3.6	3.8	5.1	5.9	3.7	2.7	1.7	37.4	97.4	45
10	95.9	-19.3	May 25	Oct. 2	129	45	3.8	2.9	2.4	2.2	2.5	2.7	3.7	4.0	5.2	4.5	4.6	3.9	42.4	128.7	45
11	93.2	3.7	May 1	Oct. 19	170	45	5.0	3.8	3.0	2.3	2.5	2.5	3.7	4.3	8.2	5.1	5.6	5.5	49.5	153.0	45
12	86.5	5.4	.....	.....	.....	20	1.7	1.2	2.0	2.2	3.3	3.0	7.1	6.7	3.5	4.4	3.7	2.4	41.2	98.6	3
13	.....	.....	.....	.....	.....	25	4.6	2.4	3.4	2.0	2.9	2.2	3.1	3.7	5.3	4.2	6.2	5.1	45.1	147.4	.....
14	96.8	-2.2	May 7	Oct. 22	167	45	6.1	4.4	3.3	2.7	2.8	3.1	5.4	4.6	5.6	4.6	5.9	6.5	55.0	167.4	45
15	99.0	-13.0	May 6	Oct. 25	171	45	2.3	3.0	3.2	3.8	4.1	4.4	5.0	6.4	8.5	6.3	3.1	2.2	52.3	117.8	45
16	98.6	-4.9	May 8	Oct. 19	163	24	2.5	2.5	2.7	3.3	4.1	4.8	5.8	5.8	6.2	4.3	3.4	2.8	48.2	114.3	24
17	99.0	0.0	May 16	Oct. 12	148	6	2.1	1.7	2.8	2.2	2.7	2.8	4.4	6.3	5.0	3.7	3.3	3.0	40.0	97.2	6
18	96.3	5.7	Apr. 22	Nov. 2	193	45	1.6	2.0	2.9	3.8	4.6	4.6	4.8	4.3	6.4	5.3	2.6	1.6	44.5	94.4	45
19	98.2	11.7	May 6	Nov. 4	181	3	1.3	1.3	2.3	6.0	5.3	3.9	3.6	4.4	6.0	5.7	2.7	2.0	44.5	93.1	3
20	96.4	-12.3	May 4	Oct. 24	172	45	5.2	4.1	4.0	4.5	4.4	4.7	7.7	7.0	7.9	7.0	7.6	0.4	70.5	187.0	45
21	.....	.....	.....	.....	.....	43	6.1	5.0	5.3	4.6	5.1	5.5	10.3	7.4	8.2	6.2	8.1	7.8	79.6	222.1	.....
22	97.3	17.2	.....	.....	.....	20	7.8	5.7	5.3	5.0	4.8	5.7	7.9	6.8	9.4	8.8	10.7	10.1	87.8	206.9	20
23	100.2	-4.0	May 7	Oct. 23	168	30	3.6	2.9	2.9	2.9	3.1	4.1	5.5	5.9	6.1	3.9	3.4	4.7	49.0	121.4	30
24	93.4	4.3	May 10	Oct. 17	159	6	5.5	3.6	3.8	3.8	4.8	3.2	6.1	4.9	6.6	4.3	4.4	0.8	57.8	167.9	6
25	101.8	-1.3	May 5	Oct. 29	176	30	1.9	2.2	2.9	3.4	3.7	5.1	5.7	6.5	8.2	4.8	2.4	2.4	49.2	98.5	30
26	97.3	-0.4	May 7	Oct. 25	170	27	2.1	2.9	3.5	3.8	4.6	6.2	5.8	7.7	9.7	6.9	2.5	2.2	57.9	120.9	27
27	93.6	15.3	Apr. 15	Nov. 8	206	19	1.7	3.3	4.2	5.2	6.5	6.2	4.8	5.5	8.9	8.7	3.8	2.3	61.1	123.9	19
28	.....	.....	.....	.....	.....	25	1.5	2.4	2.8	3.7	4.8	5.7	7.0	8.9	10.1	5.3	2.6	1.5	56.3	111.6	.....
29	97.5	12.2	Apr. 25	Oct. 24	181	6	0.7	1.6	3.2	4.9	6.8	5.1	4.1	6.8	10.6	7.5	2.6	1.9	55.8	105.8	6
30	.....	.....	.....	.....	.....	5	1.1	3.8	2.2	4.0	5.3	6.5	3.5	5.4	9.6	7.6	2.5	0.9	52.4	95.5	.....
31	97.0	10.4	Apr. 25	Oct. 31	188	30	2.1	2.8	4.3	5.1	5.8	6.0	5.4	6.0	8.5	7.2	3.5	2.2	58.9	110.5	30
32	.....	.....	.....	.....	.....	5	0.9	3.6	2.2	3.7	5.5	5.5	3.7	5.2	10.2	6.4	2.5	0.9	50.3	88.8	.....
33	87.4	9.5	Apr. 12	Nov. 6	207	28	1.3	2.3	3.3	4.3	6.1	6.2	5.9	7.1	8.7	5.9	2.7	1.6	55.4	124.4	30
34	96.4	-1.5	Apr. 26	Oct. 19	175	31	1.7	2.5	3.8	5.5	7.0	7.7	11.0	13.3	12.8	6.8	2.8	2.0	76.9	166.7	31
35	.....	.....	.....	.....	.....	7	1.5	4.4	3.5	5.4	8.5	10.1	9.1	16.0	16.8	8.1	3.0	1.2	87.6	182.8	.....
36	98.8	5.4	Apr. 29	Oct. 29	182	30	1.5	2.3	3.7	5.0	6.1	7.7	8.3	9.0	9.6	5.6	2.6	1.6	63.0	119.9	30
37	99.1	10.8	Apr. 17	Nov. 7	203	45	8.7	6.7	5.6	4.9	4.2	6.7	6.1	6.9	9.2	6.7	5.1	8.1	78.9	187.6	10
38	101.5	11.1	May 4	Oct. 27	175	3	0.5	1.5	4.2	4.7	5.2	5.6	11.9	10.2	11.7	9.5	3.8	1.4	70.2	129.4	3
39	.....	.....	.....	.....	.....	5	1.1	3.0	2.2	4.2	4.9	7.1	5.2	8.3	10.2	6.7	2.7	0.9	56.5	96.5	.....
40	101.3	11.1	Apr. 14	Nov. 5	204	30	1.3	2.0	2.6	3.6	4.8	5.7	5.7	7.9	9.1	6.1	2.2	1.4	52.4	93.2	10
41	98.6	5.7	Apr. 20	Nov. 1	194	18	1.3	3.3	3.7	4.1	5.7	6.4	5.2	8.0	11.1	8.2	3.6	1.8	62.4	119.7	18
42	.....	.....	.....	.....	.....	5	1.2	3.5	2.7	4.9	6.0	6.5	4.1	7.2	11.7	6.1	2.4	1.2	57.5	102.7	.....
43	93.6	18.9	Apr. 1	Nov. 23	235	45	3.0	4.2	5.1	5.9	5.5	8.2	4.7	4.8	8.5	10.1	5.1	3.5	66.6	127.9	10
44	.....	.....	.....	.....	.....	5	1.5	4.1	2.9	5.0	6.0	6.5	4.4	5.9	10.3	9.0	2.8	1.6	59.8	107.3	.....
45	94.8	19.8	Mar. 18	Dec. 31	287	11	2.4	3.3	4.4	4.9	5.1	6.1	4.9	7.1	8.3	8.2	3.9	2.3	60.9	110.8	11
46	.....	.....	.....	.....	.....	25	2.8	6.2	7.0	6.9	8.0	9.2	5.0	5.0	13.1	12.9	6.2	4.4	86.7	166.4	.....
47	92.8	25.5	Jan. 30	Dec. 11	314	8	1.8	4.2	6.0	5.9	8.7	7.5	5.1	3.5	10.1	8.3	5.5	3.1	67.7	123.2	8
48	.....	.....	.....	.....	.....	5	1.7	4.2	3.4	4.9	5.8	5.6	4.4	7.4	10.7	10.2	2.7	2.0	62.8	112.2	.....
49	.....	.....	.....	.....	.....	5	2.1	4.6	3.2	5.3	5.2	6.7	2.8	5.6	9.2	9.8	2.7	1.9	59.1	109.4	.....
50	97.9	13.1	Apr. 10	Nov. 10	213	15	1.4	3.1	3.6	4.4	6.3	7.2	8.0	12.1	14.2	9.1	3.6	1.6	74.6	142.6	8
51	97.3	16.5	Apr. 9	Nov. 11	215	30	2.3	3.0	4.3	5.2	5.9	6.7	5.6	7.1	10.1	7.9	3.5	2.2	63.8	114.7	10
52	100.4	16.3	Apr. 5	Nov. 18	226	10	2.4	3.2	4.6	5.2	6.4	8.0	5.9	9.7	10.9	7.2	3.3	2.0	68.8	126.0	17
53	97.3	17.2	Feb. 24	Nov. 26	274	45	2.1	3.1	4.6	5.7	5.9	6.9	6.1	7.4	10.3	9.0	3.8	2.5	67.4	124.2	10
54	97.7	19.9	.....	.....	.....	36	2.9	3.7	5.7	6.8	7.0	7.9	6.7	7.9	10.9	9.1	4.7	2.9	76.2	143.5	36
55	95.7	18.5	Apr. 4	Dec. 30	269	18	5.2	4.2	4.1	4.3	3.7	4.0	6.0	3.7	6.7	6.1	6.5	6.8	61.3	139.2	18
56	.....	.....	.....	.....	.....	5	4.6	4.2	3.7	2.4	3.1	2.5	4.5	2.1	4.0	5.0	6.4	5.0	47.5	107.9	.....
57	102.4	14.5	Apr. 10	Nov. 20	223	45	7.4	5.1	4.4	4.1	3.6	4.2	6.5	4.3	7.2	6.5	7.8	9.0	70.1	172.6	10
58	99.7	13.1	May 2	Nov. 10	191	8	17.5	14.8	8.8	4.3	3.9	3.5	5.0	4.5	8.4	8.5	13.1	20.0	112.3	248.5	8
59	99.7	10.2	Apr. 14	Nov. 10	209	45	10.6	7.1	5.8	5.1	4.3	5.6	7.7	5.8	8.1	6.9	8.5	12.3	87.8	216.0	10
60	101.3	14.5	Apr. 15	Nov. 18	216	30	10.4	7.6	8.7	6.1	5.6	7.4	8.5	6.3	10.6	8.5	10.9	13.4	102.0	245.0	30
61	93.9	19.6	Apr. 3	Dec. 20	260	7	7.4	5.3	3.7	3.7	3.8	2.9	6.1	4.1	10.1	7.1	7.2	7.8	69.2	167.7	7
62	101.3	4.8	Apr. 20	Nov. 12	205	30	11.1	7.9	6.3	5.7	6.6	7.1	7.6	5.7	9.1	6.9	8.7	13.4	95.1	226.7	30
63	.....	.....	.....	.....	.....	25	7.0	6.5	5.1	4.7	4.8	6.5	5.5	5.3	9.4	7.1	6.6	7.9	76.4	164.8	.....
64	99.7	12.4	Apr. 5	Nov. 24	232	28	10.5	7.1	6.2	5.4	5.4	6.6	6.3	8.4	9.3	7.2	8.7	12.7	91.8	218.3	28
65	89.1	-1.5	May 19	Oct. 8	141	15	1.9	3.3	4.2	4.7	6.2	8.1	8.7	10.4	12.6	7.8	3.7	2.3	73.9	187.6	9
66	101.3	-3.1	Apr. 22	Oct. 31	191	45	1.4	2.1	2.9	3.3	3.7	5.0	5.5	7.0	7.8	6.0	2.6	1.7	49.0	88.8	45
67	98.6	3.4	May 6	Oct. 27	173	45	2.4	2.9	4.6	5.7	5.5	8.7	8.5	5.9	8.5	6.3	3.5	2.7	65.2	137.3	45
68	.....	.....	.....	.....	.....	5	2.3	2.7	2.6	4.4	4.9	7.2	8.4	3.9	7.0	5.0	2.7	1.3	52.4	112.0	.....
69	95.4	-12.6	May 14	Oct. 18	156	45	1.4	1.8	2.8	3.3	3.8	5.4	5.1	4.2	6.1	4.8	2.1	1.5	42.1	90.3	45
70	99.9	2.5	May 8	Oct. 22	166	45	2.2	2.0	2.3	2.6	3.1	4.3	5.5	3.9	5.2	3.7	2.0	2.2	39.0	85.1	45
71	91.0	-1.5	May 7	Oct. 16	161	4	0.9	1.5	2.9	3.5	4.7	5.8	8.3	5.5	9.1	4.8	2.3	2.0	51.1	120.7	3
72	100.8	6.3	Apr. 20	Nov. 2	195	45	2.7	2.9	5.0	7.0	7.4	10.7	9.3	7.2	9.8	6.5	3.7	2.9	74.9	141.0	30
73	95.9	-10.3	May 12	Oct. 24	164	45	4.0	3.7	4.8	5.4	5.0	7.9	9.4	6.2	9.5	6.2	4.0	4.1	70.2	174.9	27
74	.....	.....	.....	.....	.....	10	2.3	5.4	4.9	7.2	9.2	12.8	6.9	10.8	13.2	8.7	3.5	2.5	87.4	156.2	.....
75	.....	.....	.....	.....	.....	25	3.7	4.8	6.3	8.3	7.4	12.4	11.0	13.4	13.0	8.8	4.8	3.0	97.5	198.5	.....

Station Ref. No.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Station Reference No.	LATITUDINAL AND YEAR-ROUND THERMAL ANALOGUES (nearest available) WITHIN NORTH AMERICAN REGIONS MOST CLOSELY RESEMBLING THE HIGH PRECIPITATION AND HIGH HUMIDITY AREAS WHICH CHARACTERIZE JAPAN (Based upon similarities in latitudinal positions; in total summations of day-degrees during the growing period and throughout the year; and in trends and characteristics of temperature during the major part of the year.)
	RELATIVE HUMIDITY (%)														
1	79	81	77	74	76	82	85	84	82	75	73	73	78	1	Nappan, Nova Scotia[1]
2	88	85	79	73	71	75	80	82	84	82	83	87	81	2	Fredericton, New Brunswick[4]
3	83	84	86	87	88	92	94	93	87	80	77	82	86	3	Yarmouth, Nova Scotia[1,3]
4	83	81	78	77	81	83	88	86	81	76	78	80	81	4	Springfield, Nova Scotia
5	75	73	71	71	78	82	85	83	79	74	71	73	76	5	Plymouth, Massachusetts[1]
6	74	77	77	80	84	89	91	91	88	81	73	71	81	6	Eastport, Maine[1]
7	67	67	70	72	79	84	84	84	79	71	68	86	74	7	Portland, Maine[1]
8	73	78	77	81	84	90	92	92	87	78	71	69	81	8	Glace Bay, Nova Scotia[3]
9	76	76	73	71	72	80	84	85	84	77	73	73	77	9	Saranac Lake, New York[1]
10	80	79	75	72	75	81	84	83	82	79	77	77	79	10	Roxbury, New York[1]
11	75	74	71	73	78	84	86	84	79	73	71	73	77	11	Kingston, Rhode Island[1]
12	67	70	73	79	85	89	92	88	80	75	68	65	78	12	Yarmouth, Nova Scotia[1,3]
13	....	....	....	....	....	....	....	....	....	....	....	....	....	13	Windsor, Nova Scotia[4]
14	84	84	78	73	76	82	87	86	83	80	77	80	81	14	Kingston, Rhode Island[1,2]
15	58	63	68	65	75	83	86	86	83	79	71	61	73	15	New London, Connecticut[1,2]
16	80	79	76	72	75	80	84	84	85	83	80	81	80	16	Brentwood, New York
17	73	72	71	67	71	76	80	80	82	80	76	75	75	17	Worcester, Massachusetts
18	73	72	72	71	78	84	87	86	83	81	76	75	78	18	Atlantic City, New Jersey
19	76	70	70	73	78	83	87	83	84	80	75	74	78	19	Atlantic City, New Jersey
20	74	74	74	73	80	82	86	83	82	80	77	74	78	20	Cutchogue, New York[2]
21	....	....	....	....	....	....	....	....	....	....	....	....	....	21	South Orange, New Jersey[1,2]
22	75	73	71	72	76	81	84	82	81	78	75	76	77	22	Cape May, New Jersey[2]
23	85	83	78	71	71	76	80	80	83	84	83	86	80	23	Paterson, New Jersey
24	87	84	81	76	75	76	82	84	85	85	85	87	82	24	Dover, New Jersey[1,2]
25	73	71	68	67	70	77	81	82	84	81	76	75	75	25	Elizabeth, New Jersey[1]
26	71	70	68	69	73	80	84	85	85	81	75	72	76	26	Atlantic City, New Jersey[2]
27	88	69	71	75	79	87	87	84	82	78	73	68	77	27	Montreat, North Carolina[1,2]
28	....	....	....	....	....	....	....	....	....	....	....	....	....	28	Darlington, Maryland[1,2]
29	72	72	72	78	81	84	85	86	87	86	82	77	80	29	Jefferson, North Carolina[1,2]
30	....	....	....	....	....	....	....	....	....	....	....	....	....	30	Springdale, Tennessee[1]
31	69	69	71	76	79	84	86	86	86	84	78	72	78	31	Rugby, Tennessee[1]
32	....	....	....	....	....	....	....	....	....	....	....	....	....	32	Carthage, Tennessee[1]
33	68	70	75	79	82	89	92	92	92	86	77	70	81	33	Banners Elk, North Carolina[1]
34	65	64	65	68	72	81	84	83	84	80	71	67	73	34	Linville, North Carolina[1,2]
35	....	....	....	....	....	....	....	....	....	....	....	....	....	35	Highlands, North Carolina[1]
36	72	69	60	73	78	80	83	83	84	81	77	73	77	36	Hendersonville, North Carolina[1]
37	57	57	58	61	71	77	79	82	81	77	68	61	69	37	Brevard, North Carolina[1,2]
38	83	59	66	70	77	81	83	83	87	86	83	73	76	38	Rugby, Tennessee[1,2]
39	....	....	....	....	....	....	....	....	....	....	....	....	....	39	Marion, North Carolina[1]
40	59	59	64	68	75	80	82	84	83	81	75	66	73	40	Brewers, North Carolina[1]
41	67	69	70	76	81	84	86	85	86	83	77	71	78	41	Lenoir, North Carolina[1,2]
42	....	....	....	....	....	....	....	....	....	....	....	....	....	42	Marion, North Carolina[1]
43	62	65	70	74	82	88	89	86	83	78	74	69	76	43	Dahlonega, Georgia[1]
44	....	....	....	....	....	....	....	....	....	....	....	....	....	44	Alpha, Kentucky[1]
45	61	64	67	75	81	86	88	85	84	79	72	65	76	45	Riverton, Alabama[1,2]
46	....	....	....	....	....	....	....	....	....	....	....	....	....	46	Walhalla, South Carolina[1]
47	64	66	70	79	83	87	89	87	87	79	74	69	78	47	Oneonta, Alabama[1,2]
48	....	....	....	....	....	....	....	....	....	....	....	....	....	48	Lynnville, Tennessee[1,2]
49	....	....	....	....	....	....	....	....	....	....	....	....	....	49	Chimney Rock, North Carolina[1]
50	65	67	87	73	79	81	83	83	85	82	74	70	76	50	Rock House, North Carolina[1,3]
51	58	58	64	67	73	78	79	79	78	77	72	65	71	51	Roxboro, North Carolina[1,2]
52	69	68	70	77	81	84	86	84	85	82	78	73	78	52	Clayton, Georgia[1]
53	59	61	87	70	76	81	82	81	81	79	73	66	73	53	Clayton, Georgia[1]
54	67	67	71	77	80	85	87	86	85	81	75	68	77	54	Statesville, North Carolina[1,2]
55	75	72	69	71	76	82	82	78	77	74	74	76	75	55	Easton, Maryland
56	....	....	....	....	....	....	....	....	....	....	....	....	....	56	Princess Anne, Maryland[1,2]
57	77	74	72	70	75	78	81	77	78	75	74	76	76	57	Lexington, Kentucky[1,2]
58	81	80	76	73	75	78	80	78	82	82	80	81	79	58	New Martinsville, West Virginia[1,2]
59	87	84	77	74	76	80	82	80	80	80	81	85	81	59	Greensburg, Kentucky[1,2]
60	78	76	73	73	75	79	81	79	81	79	77	77	77	60	Beallsville, Kentucky[1,2]
61	81	79	73	71	74	80	83	81	80	74	77	80	78	61	Elkhorn, West Virginia[1,2]
62	86	84	79	76	76	80	82	81	85	85	85	86	82	62	Nail, Arkansas[1,2]
63	....	....	....	....	....	....	....	....	....	....	....	....	....	63	Decatur, Tennessee[1,2]
64	78	78	73	74	76	80	80	79	81	80	77	78	77	64	Tullahoma, Tennessee[1,2]
65	70	72	72	77	82	87	87	87	88	87	76	72	80	65	Nothing comparable within the required latitudes
66	65	65	65	88	73	76	79	81	82	81	78	72	74	86	Rugby, Tennessee[1,3]
67	67	86	65	66	70	76	78	79	81	81	76	71	73	67	Brevard, North Carolina[1]
68	....	....	....	....	....	....	....	....	....	....	....	....	....	88	Buckhannon, West Virginia[1]
69	70	72	68	64	86	72	75	76	78	79	76	70	72	69	Frostburg, Maryland
70	82	78	73	67	70	73	77	75	79	80	79	83	76	70	Nuttallburg, West Virginia[1]
71	70	71	73	76	78	83	88	87	88	87	81	79	80	71	Nothing comparable within the required latitudes
72	74	69	67	69	73	77	78	79	79	78	73	75	74	72	Clayton, Georgia[1]
73	82	79	65	72	72	77	80	80	81	82	82	84	79	73	Pickens, West Virginia[1,2]
74	....	....	....	....	....	....	....	....	....	....	....	....	....	74	Caroleen, North Carolina[1,2]
75	....	....	....	....	....	....	....	....	....	....	....	....	....	75	Rugby, Tennessee[1,2]

*Station No. 26—KANAYAMA, in Igu-gun should be listed under Miyagi Prefecture.

Compared with Japanese station. [1] springtime mostly cooler; remainder of year mostly warmer [2] less precipitation [3] more precipitation [4] cooler in summer and autumn

(Based upon monthly

MAJOR ISLAND	PREFECTURE	SHI or GUN	METEOROLOGICAL STATION	Station Ref. No.	Latitude (N.)	Longitude (E.)	Altitude (Feet)	Length of Record (Years)	MEAN TEMPERATURES (° F.) Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Annual Range	ABSOLUTE TEMP. (° F.) Max.	Min.	KILLING FROST AVERAGE DATES Last in Spring	First in Fall	Duration of Average Frostless Season (Days)	Length of Record (Years)	Jan.	Feb.	Mar.
HOKKAIDŌ	HOKKAIDŌ	Abashiri-gun	ABASHIRI	1	44°01′	144°17′	128	45	19.4	18.7	26.4	37.9	46.8	54.3	62.6	66.7	60.3	49.8	37.4	25.9	42.3	48.0	96.8	-20.6	May 28	Oct. 7	131	45	2.7	1.7	2.4
		Asahigawa-shi	ASAHIGAWA	2	43°47′	142°22′	370	45	14.2	16.3	25.2	38.8	50.5	60.3	67.8	69.3	59.2	46.0	34.2	21.7	42.1	55.1	96.6	-41.3	May 27	Sept. 2	97	45	2.9	2.2	2.1
		Hidaka-shichō, Horoizumi-gun	ERIMO	3	41°55′	143°15′	210	40	27.0	27.3	30.9	38.3	44.6	51.4	59.2	64.9	62.1	53.8	43.0	31.5	44.6	37.9	85.3	-4.4				40	1.0	0.8	1.5
		Rumoi shichō, Tomamae-gun	HABORO	4	44°23′	141°42′	69	9	21.0	22.1	28.0	39.9	48.0	57.0	66.2	69.3	62.2	51.3	38.8	28.2	44.4	48.3	91.2	-15.5	May 12	Oct. 25	165	9	3.8	2.4	2.0
		Hakodate-shi	HAKODATE	5	41°17′	140°43′	10	45	26.4	27.5	33.4	43.2	50.9	58.3	66.4	70.9	64.4	53.6	42.1	31.3	47.5	44.5	92.3	-7.1	May 14	Oct. 14	152	45	2.7	2.5	2.6
		Kushiro-shi	KUSHIRO	6	42°59′	144°24′	111	30	19.8	20.1	27.5	37.0	44.1	51.1	59.5	64.0	59.2	49.5	38.3	26.2	41.4	44.2	96.8	-18.9	May 22	Oct. 11	141	20	2.0	1.4	2.6
		Muroran-shi	MURORAN	7	42°20′	140°57′	66	7	26.6	26.6	31.8	41.2	48.7	55.9	67.1	70.5	65.1	54.5	43.2	32.0	46.9	43.9	91.0	8.1	Apr. 23	Oct. 11	170	7	2.2	1.7	2.1
		Nemuro-shichō, Nemuro-gun	NEMURO	8	43°20′	145°35′	88	45	22.8	21.6	27.9	36.9	43.5	49.6	57.6	62.8	59.5	51.4	40.3	29.1	41.9	41.2	89.8	-8.9	May 27	Oct. 9	134	45	1.6	1.3	2.6
		Obihiro-shi	OBIHIRO	9	42°55′	143°12′	134	45	13.3	15.3	25.9	39.4	49.5	57.2	64.8	67.5	59.4	47.7	35.1	21.4	41.4	54.2	100.0	-36.8	May 27	Sept. 26	121	45	1.4	1.4	2.3
		Sapporo-shi	SAPPORO	10	43°04′	141°21′	56	45	20.8	22.8	29.5	41.4	50.9	59.0	66.9	70.0	61.7	49.6	37.9	26.2	44.8	49.2	95.9	-19.3	May 25	Oct. 2	129	45	3.8	2.9	2.4
		Shiribeshi-shichō, Suttsu-gun	SUTTSU	11	42°48′	140°13′	55	30	26.2	27.5	31.8	42.1	50.0	57.2	65.1	69.8	63.7	52.9	40.8	30.0	46.4	43.6	93.2	3.7	May 1	Oct. 19	170	45	5.0	3.8	3.0
		Hidaka-shichō, Urakawa-gun	URAKAWA	12	42°09′	142°47′	115	3	25.5	24.3	31.3	39.7	46.6	53.2	64.9	69.1	63.5	54.3	43.0	31.8	45.7	44.8	86.5	5.4				20	1.7	1.2	2.0
		Sōya-shichō, Sōya-gun	WAKKANAI	13	45°25′	141°40′		10	20.8	21.6	27.7	39.6	47.7	56.5	64.0	68.9	63.0	52.3	37.8	28.0	43.9	48.1						25	4.6	2.4	3.4
HONSHŪ	AOMORI	Aomori-shi	AOMORI	14	40°50′	140°45′	43	45	27.0	27.7	33.1	44.1	53.2	61.3	69.3	73.9	65.1	54.8	42.4	32.0	48.6	46.9	96.8	-2.2	May 7	Oct. 22	167	45	6.1	4.4	3.3
	IWATE	Miyako-shi	MIYAKO	15	39°38′	141°59′	100	45	30.6	31.1	36.5	46.6	54.1	61.0	68.5	72.0	65.5	55.0	45.1	35.6	50.2	41.4	99.0	-13.0	May 6	Oct. 25	171	45	2.3	3.0	3.2
		Isawa-gun	MIZUSAWA	16	39°08′	141°08′	208	24	27.0	28.2	34.3	46.9	55.6	63.7	71.8	73.9	65.7	53.8	42.8	32.0	49.6	46.9	98.6	-4.9	May 8	Oct. 19	163	24	2.5	2.5	2.7
		Morioka-shi	MORIOKA	17	39°42′	141°10′	416	6	25.5	26.1	32.0	45.9	55.2	62.4	72.1	73.4	64.9	52.0	42.1	31.6	48.6	47.9	99.0	0.0	May 16	Oct. 12	148	6	2.1	1.7	2.8
	MIYAGI	Ishinomaki-shi	ISHINOMAKI	18	38°26′	141°19′	148	45	31.1	32.2	37.4	47.3	55.4	63.0	70.3	73.9	67.5	56.8	46.2	36.0	51.4	42.8	96.3	5.7	Apr. 22	Nov. 2	193	45	1.6	2.0	2.9
		Sendai-shi	SENDAI	19	38°16′	140°54′	131	3	31.1	30.7	37.0	47.8	56.1	62.8	72.7	74.8	67.3	57.4	47.1	37.0	51.8	44.1	98.2	11.7	May 6	Nov. 4	181	3	1.3	1.3	2.3
	AKITA	Akita-shi	AKITA	20	39°43′	140°06′	33	45	29.3	29.5	35.4	46.6	55.6	64.6	72.1	75.0	66.6	55.0	44.4	34.3	50.7	45.7	96.4	-12.3	May 4	Oct. 24	172	45	5.2	4.1	4.0
		Semboku-gun	KAKUNODATE	21	39°36′	140°34′		7	27.8	29.1	33.3	47.7	56.5	65.7	74.1	76.6	68.0	55.6	44.2	32.2	50.7	48.8						43	6.1	5.0	5.3
	YAMAGATA	Nishi-tagawa-gun	KAMO	22	38°44′	139°41′	41	19	35.8	35.2	39.6	49.8	57.4	66.0	73.6	76.3	69.1	59.0	49.1	39.6	54.1	41.1	97.3	17.2				20	7.8	5.7	5.3
		Yamagata-shi	YAMAGATA	23	38°15′	140°21′	509	45	28.8	29.5	35.6	47.7	57.7	66.4	73.8	75.4	66.9	54.7	43.5	33.8	51.1	46.6	100.2	-4.0	May 7	Oct. 23	168	30	3.6	2.9	2.9
	FUKUSHIMA	Yama-gun	INAWASHIRO	24	37°34′	140°07′	1740	6	26.4	26.4	31.1	45.1	54.9	63.0	72.1	73.0	65.1	52.7	42.6	32.9	48.7	46.6	93.4	4.3	May 10	Oct. 17	159	6	5.5	3.6	3.8
		Fukushima-shi	FUKUSHIMA	25	37°45′	140°24′	203	30	33.1	33.8	38.8	50.4	58.8	66.4	73.6	75.6	68.0	56.5	46.2	37.2	53.2	42.5	101.8	-1.3	May 5	Oct. 29	176	30	1.9	2.2	2.9
		Igu-gun	KANAYAMA*	26	37°53′	140°46′	74	27	33.1	33.8	38.5	49.3	57.4	64.6	71.8	73.9	67.1	56.1	45.9	37.2	52.3	40.1	97.3	-0.4	May 7	Oct. 25	170	27	2.1	2.9	3.5
		Iwaki-gun	ONAHAMA	27	36°56′	140°54′	20	19	36.3	37.2	41.0	50.4	57.0	63.9	70.3	74.5	69.6	59.5	50.2	41.0	54.3	38.2	93.6	15.3	Apr. 15	Nov. 8	206	19	1.7	3.3	4.2
		Nishi-shirakawa-gun	SHIRAKAWA	28	37°08′	140°13′	1140	10	31.3	32.7	37.4	49.6	57.0	64.9	73.4	75.9	67.8	56.3	45.9	36.0	52.3	44.6						25	1.5	2.4	2.8
	IBARAKI	Niihari-gun	KAKIOKA	29	36°14′	140°11′	98	6	34.3	34.7	39.7	51.6	59.4	65.5	74.8	77.3	69.6	58.1	48.0	39.7	54.3	43.0	97.5	12.2	Apr. 25	Oct. 24	181	6	0.7	1.6	3.2
		Niihari-gun	ISHIOKA	30	36°11′	140°16′		10	36.7	38.5	43.3	54.0	61.0	67.8	76.8	78.6	72.9	61.0	50.5	41.2	56.8	41.9						5	1.1	3.8	2.2
		Mito-shi	MITO	31	36°23′	140°28′	102	30	35.6	37.0	41.9	52.0	59.5	66.2	73.0	75.7	69.8	59.2	48.9	39.4	54.9	40.1	97.0	10.4	Apr. 25	Oct. 31	188	30	2.1	2.8	4.3
		Makabe-gun	SHIMODATE	32	36°18′	139°59′		10	36.0	38.1	43.2	55.4	62.4	68.9	77.5	80.2	72.9	61.5	51.3	40.6	57.4	44.2						5	0.9	3.6	2.2
		Tsukuba-gun	TSUKUBASAN-CHO	33	36°13′	140°06′	2854	28	29.8	29.8	34.7	45.7	52.7	59.7	67.1	68.5	62.4	52.7	44.1	34.9	48.6	38.7	87.4	9.5	Apr. 12	Nov. 6	207	28	1.3	2.3	3.3
	TOCHIGI	Kami-tsuga-gun	ASHIO	34	36°39′	139°27′	2211	31	29.7	30.4	36.0	47.5	54.7	61.9	68.9	70.5	64.2	53.6	43.7	34.5	49.6	40.8	96.4	-1.5	Apr. 26	Oct. 19	175	31	1.7	2.5	3.8
		Kami-tsuga-gun	NIKKŌ	35	36°45′	139°36′	2013	7	30.9	31.8	37.0	49.3	56.3	63.1	71.2	72.9	67.5	54.9	45.5	36.0	51.3	42.0						7	1.5	4.4	3.5
		Utsunomiya-shi	UTSUNOMIYA	36	36°34′	139°54′	410	30	33.6	35.2	40.8	52.0	59.9	67.3	73.9	76.1	69.3	58.1	47.1	37.2	54.1	42.5	98.8	5.4	Apr. 29	Oct. 29	182	30	1.5	2.3	3.7
	GUMMA	Maebashi-shi	MAEBASHI	37	36°24′	139°04′	371	30	36.0	37.2	42.4	53.1	60.4	68.0	74.8	76.6	69.6	58.8	49.1	39.1	55.6	40.6	99.1	10.8	Apr. 17	Nov. 7	203	45	8.7	6.7	5.6
	SAITAMA	Chichibu-gun	CHICHIBU	38	35°59′	139°05′	794	3	33.1	33.3	40.5	53.4	60.6	67.3	76.1	76.1	68.7	58.5	48.2	39.6	54.7	43.0	101.5	11.1	May 4	Oct. 27	175	3	0.5	1.5	4.2
		Kawagoe-shi	KAWAGOE	39	35°55′	139°29′	78	10	37.0	39.4	44.6	55.9	62.8	70.3	79.2	80.6	73.4	61.9	51.4	41.2	58.1	43.6						5	1.1	3.0	2.2
		Kumagaya-shi	KUMAGAYA	40	36°09′	139°23′	105	30	36.1	37.8	43.0	53.6	61.2	68.7	75.6	77.4	70.5	59.4	49.1	39.9	55.9	41.3	101.3	11.1	Apr. 14	Nov. 5	204	30	1.3	2.0	2.6
		Iruma-gun	TOKOROZAWA	41	35°48′	139°28′	236	18	34.5	36.5	41.7	52.7	60.1	67.5	75.4	76.8	70.2	59.0	48.7	38.8	55.2	42.3	98.6	5.7	Apr. 20	Nov. 1	194	18	1.3	3.3	3.7
		Urawa-shi	URAWA	42	35°51′	139°39′		10	36.9	38.8	43.9	55.2	61.7	69.3	77.5	79.5	73.2	61.3	51.4	41.4	57.6	42.6						5	1.2	3.5	2.7
	CHIBA	Chōshi-shi	CHŌSHI	43	35°44′	140°51′	64	45	41.4	41.9	46.6	54.9	61.0	66.6	72.7	76.5	72.5	64.4	55.8	46.2	58.5	35.1	93.6	18.9	Apr. 1	Nov. 23	235	45	3.0	4.2	5.1
		Higashi-katsushika-gun	FUSA	44	35°51′	140°08′		10	37.9	41.2	45.3	56.5	62.6	68.9	77.0	79.3	73.6	62.6	53.1	42.8	58.5	41.4						5	1.5	4.1	2.9
		Isumi-gun	KATSUURA	45	35°09′	140°19′	44	18	41.9	42.8	47.1	56.8	62.4	67.8	74.7	78.1	73.9	63.9	55.9	46.4	59.4	36.2	94.8	19.8	Mar. 18	Dec. 31	287	11	2.4	3.3	4.4
		Kisarazu-shi	KISARAZU	46	35°23′	139°55′		10	40.5	41.2	46.4	56.5	63.3	68.7	78.3	80.4	75.6	64.8	54.7	44.8	59.5	39.9						25	2.8	6.2	7.0
		Awa-gun	MERA	47	34°55′	139°50′	43	8	43.0	43.7	47.7	56.8	63.0	68.4	74.7	78.1	73.6	64.2	56.8	48.9	59.9	35.1	92.8	25.5	Jan. 30	Dec. 11	314	8	1.8	4.2	6.0
		Imba-gun	SAKURA	48	35°43′	140°14′		10	38.1	39.9	53.8	55.6	62.2	68.9	77.9	78.4	74.5	63.0	53.4	42.6	58.3	40.3						5	1.7	4.2	3.4
		Katori-gun	SAWARA	49	35°43′	140°30′		10	38.7	40.6	44.8	55.9	62.1	68.4	77.2	79.3	74.3	62.8	52.2	43.2	58.3	40.6						5	2.1	4.6	3.2
TŌKYŌ		Nishi-tama-gun	ŌME	50	35°47′	139°15′	666	15	34.5	35.8	40.5	51.8	59.0	66.2	74.3	75.2	69.4	58.8	48.9	39.2	54.5	40.7	97.9	13.1	Apr. 10	Nov. 10	213	15	1.4	3.1	3.6
		Tōkyō-to	TŌKYŌ	51	35°41′	139°46′	19	45	37.6	38.8	44.6	54.7	62.2	69.1	76.1	78.3	71.8	61.2	51.3	41.5	57.2	40.7	97.3	16.5	Apr. 9	Nov. 11	215	30	2.3	3.0	4.3
KANAGAWA		Koza-gun	CHIGASAKI	52	35°19′	139°23′	36	26	38.7	40.3	45.1	55.4	62.1	68.7	75.6	77.7	71.6	61.3	52.0	42.3	57.6	39.0	100.4	16.3	Apr. 5	Nov. 18	226	10	2.4	3.2	4.6
		Yokohama-shi	YOKOHAMA	53	35°26′	139°39′	125	30	39.2	40.3	45.1	55.2	62.6	69.1	76.5	78.3	72.3	61.9	52.3	43.5	57.9	39.1	97.3	17.2	Feb. 24	Nov. 26	274	45	2.1	3.1	4.6
		Yokosuka-shi	YOKOSUKA	54	35°17′	139°40′	38	30	40.5	40.8	45.7	55.4	62.1	68.4	74.8	77.4	72.0	62.1	53.4	45.1	58.1	36.9	97.7	19.9				36	2.9	3.7	5.7
NIIGATA		Sado-gun	AIKAWA	55	38°02′	138°14′	148	8	36.0	36.5	40.1	50.0	57.6	66.0	74.3	77.9	71.1	60.8	50.9	41.4	55.2	41.9	95.7	18.5	Apr. 4	Dec. 30	269	18	5.2	4.2	4.1
		Sado-gun	HAMOCHI	56	37°51′	138°19′		10	35.8	36.9	41.0	51.6	59.5	68.0	76.5	79.2	72.5	61.5	50.9	41.2	56.1	43.4						5	4.6	4.2	3.7
		Niigata-shi	NIIGATA	57	37°55′	139°03′	84	30	34.7	34.9	39.7	50.4	58.1	66.9	74.5	77.7	70.3	59.4	48.9	39.2	54.7	43.0	102.4	14.5	Apr. 10	Nov. 20	223	45	7.4	5.1	4.4
		Takada-shi	TAKADA	58	37°06′	138°15′	49	8	33.3	34.0	37.8	50.0	59.7	67.5	76.6	79.2	71.1	58.8	49.5	39.4	54.7	45.9	99.7	13.1	May 2	Nov. 10	191	8	17.5	14.8	8.8
TOYAMA		Takaoka-shi	FUSHIKI	59	36°47′	137°03′	44	30	36.1	36.1	41.2	50.9	59.2	67.5	75.4	78.3	71.1	60.1	49.8	40.3	55.6	42.2	99.7	10.2	Apr. 14	Nov. 10	209	45	10.6	7.1	5.8
ISHIKAWA		Kanazawa-shi	KANAZAWA	60	36°32′	136°69′	94	30	36.9	36.7	41.5	50.0	60.1	67.8	75.2	77.7	70.5	59.7	50.2	41.2	55.9	41.0	101.3	14.5	Apr. 15	Nov. 18	216	30	10.4	7.6	6.7
		Fugeshi-gun	MINAZUKI	61	37°22′	136°45′	531	7	34.3	35.1	39.4	50.2	58.6	65.5	73.8	77.5	70.9	60.1	50.3	40.1	54.7	43.2	93.9	19.6	Apr. 3	Dec. 20	260	7	7.4	5.3	3.7
FUKUI		Fukui-shi	FUKUI	62	36°03′	136°16′	35	30	36.6	36.7	42.1	52.9	61.3	69.1	76.6	78.6	70.9	59.4	49.8	40.6	56.1	43.3	101.3	4.8	Apr. 20	Nov. 12	205	30	11.1	7.9	6.3
		Onyū-gun	OBAMA	63	35°31′	135°45′		10	37.9	39.0	43.2	54.9	62.4	70.2	79.7	81.0	74.3	62.4	53.2	43.7	58.5	43.1						25	7.0	6.5	5.1
		Tsuruga-shi	TSURUGA	64	35°38′	136°03′	29	45	38.5	38.3	43.5	53.1	61.2	69.1	76.8	78.8	71.8	61.3	52.2	43.5	57.4	40.5	99.7	12.4	Apr. 5	Nov. 24	232	28	10.5	7.1	6.2
YAMANASHI		Naka-koma-gun	ŌCHIAI (KAI)	65	35°48′	138°49′	3687	15	24.8	26.1	31.3	42.8	50.0	57.7	65.5	66.0	60.4	49.1	39.4	30.2	45.3	41.2	89.1	-1.5	May 19	Oct. 8	141	15	1.9	3.3	4.2
		Kōfu-shi	KŌFU	66	35°38′	138°34′	853	45	34.2	36.7	44.1	55.0	62.1	69.8	77.2	77.9	71.1	59.4	48.4	38.5	56.1	43.7	101.3	-3.1	Apr. 22	Oct. 31	191	45	1.4	2.1	2.9
NAGANO		Iida-shi	IIDA	67	35°31′	137°50′	1587	45	31.8	33.1	40.1	51.4	59.4	67.1	74.3	75.2	67.1	56.3	45.5	36.7	53.2	43.4	98.6	3.4	May 6	Oct. 27	173	45	2.4	2.9	4.6
		Suwa-gun	KAMI-SUWA	68	36°02′	138°07′	2300	10	28.4	30.4	37.0	50.7	58.3	66.4	74.3	75.4	68.4	55.0	44.6	34.3	52.0	47.0						5	2.3	2.7	2.6
		Matsumoto-shi	MATSUMOTO	69	36°14′	137°59′	1909	45	28.2	28.9	36.3	48.4	57.4	65.8	73.0	73.6	65.8	53.8	43.2	34.0	50.7	45.4	95.4	-12.6	May 14	Oct. 18	156	45	1.4	1.8	2.8
		Nagano-shi	NAGANO	70	36°40′	138°12′	1378	45	28.6	29.8	36.7	48.9	58.1	66.6	74.1	75.7	67.5	55.6	44.4	34.2	51.6	47.1	99.9	2.5	May 8	Oct. 22	166	45	2.2	2.0	2.3
		Kita-saku-gun	OIWAKE	71	36°20′	138°33′	3302	4	24.3	23.5	29.7	42.3	51.6	58.1	67.6	68.2	60.8	49.3	38.8	30.4	45.3	44.7	91.0	-1.5	May 7	Oct. 16	161	4	0.9	1.5	2.9
GIFU		Gifu-shi	GIFU	72	35°24′	136°46′	48	45	37.0	38.3	44.2	54.5	62.8	70.5	78.1	79.3	72.3	61.3	50.9	41.7	57.6	42.3	100.8	6.3	Apr. 20	Nov. 2	195	45	2.7	2.9	5.0
		Takayama-shi	TAKAYAMA	73	36°09′	137°15′	1839	45	26.6	25.7	34.9	47.1	56.5	64.9	72.1	73.4	67.6	53.6	42.3	32.7	50.0	47.7	95.9	-10.3	May 12	Oct. 24	164	45	4.0	3.7	4.8
SHIZUOKA		Atami-shi	ATAMI	74	35°06′	139°04′		10	42.4	43.0	46.8	56.7	62.4	68.5	76.5	77.9	73.6	63.9	55.8	46.9	59.5	35.5						10	2.3	5.4	4.9
		Sunto-gun	GOTEMBA	75	35°18′	138°56′	1300	10	36.6	37.6	41.9	52.7	59.0	66.0	73.4	75.2	70.2	59.4	49.8	40.5	55.0	38.6						25	3.7	4.8	6.3

*Station No. 26—KANAYAMA, in Igu-gun should be listed under Miyagi Prefecture.

OF JAPAN AND ITS NORTH AMERICAN CLIMATIC ANALOGUES —1

sed upon monthly and annual meteorological data)

AVERAGE PRECIPITATION (Inches)													Precipitation Effectivity Index	Length of Record (Years)	RELATIVE HUMIDITY (%)												Station Reference No.	LATITUDINAL AND YEAR-ROUND THERMAL ANALOGUES (nearest available) WITHIN NORTH AMERICAN REGIONS MOST CLOSELY RESEMBLING THE HIGH PRECIPITATION AND HIGH HUMIDITY AREAS WHICH CHARACTERIZE JAPAN (Based upon similarities in latitudinal positions; in total summations of day-degrees during the growing period and throughout the year; and in trends and characteristics of temperature during the major part of the year.)
Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly		
2.7	1.7	2.4	2.0	2.5	2.5	3.5	3.8	4.7	3.0	2.7	2.2	33.7	96.4	30	79	81	77	74	76	82	85	84	82	75	73	73	78	1	Nappan, Nova Scotia[1]
2.9	2.2	2.1	2.0	2.6	3.1	4.6	4.9	5.7	4.3	4.4	4.1	42.9	127.2	30	88	85	79	73	71	75	80	82	84	82	83	87	81	2	Fredericton, New Brunswick[4]
1.0	0.8	1.5	2.6	3.2	3.3	3.9	3.8	4.7	4.2	2.9	2.1	34.0	82.9	30	83	84	86	87	88	92	94	93	87	80	77	82	86	3	Yarmouth, Nova Scotia[1,3]
3.8	2.4	2.0	2.1	3.2	2.2	4.6	4.6	6.1	6.7	6.3	4.9	48.9	146.3	9	83	81	78	77	81	83	88	86	81	76	78	80	81	4	Springfield, Nova Scotia.
2.7	2.5	2.6	2.7	3.4	3.5	5.4	5.1	6.8	4.6	4.2	3.3	46.8	120.4	30	75	73	71	71	76	82	85	83	79	74	71	73	76	5	Plymouth, Massachusetts[1]
2.0	1.4	2.6	3.5	3.7	4.4	4.5	5.5	6.0	4.6	2.9	2.0	43.1	119.0	20	74	77	77	80	84	89	91	91	88	81	73	71	81	6	Eastport, Maine[1]
2.2	1.7	2.1	2.0	3.7	3.1	4.6	6.5	5.7	4.6	3.9	3.5	43.6	108.2	7	67	67	70	72	79	84	84	84	79	71	68	66	74	7	Portland, Maine[1]
1.6	1.3	2.6	3.1	3.7	3.7	4.1	4.1	5.8	4.3	3.5	2.2	40.0	110.3	30	73	78	77	81	84	90	92	92	87	78	71	69	81	8	Glace Bay, Nova Scotia[3]
1.4	1.4	2.3	2.5	3.3	3.6	3.8	5.1	5.9	3.7	2.7	1.7	37.4	97.4	45	76	76	73	71	72	80	84	85	84	77	73	73	77	9	Saranac Lake, New York[1]
3.8	2.9	2.4	2.2	2.5	2.7	3.7	4.0	5.2	4.5	4.6	3.9	42.4	128.7	45	80	79	75	72	75	81	84	83	82	79	77	77	79	10	Roxbury, New York[1]
5.0	3.8	3.0	2.3	2.5	2.5	3.7	4.3	6.2	5.1	5.6	5.5	49.5	153.0	45	75	74	71	73	78	84	86	84	79	73	71	73	77	11	Kingston, Rhode Island[1]
1.7	1.2	2.0	2.2	3.3	3.0	7.1	6.7	3.5	4.4	3.7	2.4	41.2	98.6	3	67	70	73	79	85	89	92	88	80	75	68	65	78	12	Yarmouth, Nova Scotia[1,3]
4.6	2.4	3.4	2.0	2.9	2.2	3.1	3.7	5.3	4.2	6.2	5.1	45.1	147.4															13	Windsor, Nova Scotia[4]
6.1	4.4	3.3	2.7	2.8	3.1	5.4	4.6	5.6	4.6	5.9	6.5	55.0	167.4	45	84	84	78	73	76	82	87	86	83	80	77	80	81	14	Kingston, Rhode Island[1,2]
2.3	3.0	3.2	3.8	4.1	4.4	5.0	6.4	8.5	6.3	3.1	2.2	52.3	117.8	45	58	63	68	65	75	83	86	86	83	79	71	61	73	15	New London, Connecticut[1,2]
2.5	2.5	2.7	3.3	4.1	4.8	5.8	5.8	6.2	4.3	3.4	2.8	48.2	114.3	24	80	79	76	72	75	80	84	84	85	83	80	81	80	16	Brentwood, New York
2.1	1.7	2.8	2.2	2.7	2.8	4.4	6.3	5.0	3.7	3.3	3.0	40.0	97.2	6	73	72	71	67	71	76	80	80	82	80	76	75	75	17	Worcester, Massachusetts
1.6	2.0	2.9	3.8	4.6	4.6	4.8	4.3	6.4	5.3	2.6	1.6	44.5	94.4	45	73	72	72	71	78	84	87	86	83	81	76	75	78	18	Atlantic City, New Jersey.
1.3	1.3	2.3	6.0	5.3	3.9	3.6	4.4	6.0	5.7	2.7	2.0	44.5	93.1	3	76	70	70	73	78	83	87	83	84	80	75	74	78	19	Atlantic City, New Jersey.
5.2	4.1	4.0	4.5	4.4	4.7	7.7	7.0	7.9	7.0	7.6	6.4	70.5	187.0	45	74	74	74	73	80	82	86	83	82	80	77	74	78	20	Cutchogue, New York[2]
6.1	5.0	5.3	4.6	5.1	5.5	10.3	7.4	8.2	6.2	8.1	7.8	79.6	222.1															21	South Orange, New Jersey[1,2]
7.8	5.7	5.3	5.0	4.6	5.7	7.9	6.8	9.4	8.8	10.7	10.1	87.8	206.9	20	75	73	71	72	76	81	84	82	81	78	75	76	77	22	Cape May, New Jersey[2]
3.6	2.9	2.9	2.9	3.1	4.1	5.5	5.9	6.1	3.9	3.4	4.7	49.0	121.4	30	85	83	78	71	71	76	80	80	83	84	83	86	80	23	Paterson, New Jersey
5.5	3.6	3.8	3.8	4.8	3.2	6.1	4.9	6.6	4.3	4.4	6.8	57.8	167.9	6	87	84	81	76	75	76	82	84	85	85	85	87	82	24	Dover, New Jersey[1,2]
1.9	2.2	2.9	3.4	3.7	5.1	5.7	6.5	8.2	4.8	2.4	2.4	49.2	98.5	30	73	71	68	67	70	77	81	82	84	81	76	75	75	25	Elizabeth, New Jersey[1]
2.1	2.9	3.5	3.8	4.6	6.2	5.8	7.7	9.7	6.9	2.5	2.2	57.9	120.9	27	71	70	68	69	73	80	84	85	85	81	75	72	76	26	Atlantic City, New Jersey[2]
1.7	3.3	4.2	5.2	6.5	6.2	4.8	5.5	8.9	8.7	3.8	2.3	61.1	123.9	19	68	69	71	75	79	87	87	84	82	78	73	68	77	27	Montreat, North Carolina[1,2]
1.5	2.4	2.8	3.7	4.8	5.7	7.0	8.9	10.1	5.3	2.6	1.5	56.3	111.6															28	Darlington, Maryland[1,2]
0.7	1.6	3.2	4.9	6.8	5.1	4.1	6.8	10.6	7.5	2.6	1.9	55.8	105.8	6	72	72	72	78	81	84	85	86	87	86	82	77	80	29	Jefferson, North Carolina[1,2]
2.1	3.8	2.2	4.0	5.3	6.5	3.5	5.4	9.6	7.6	2.5	0.9	52.4	95.5															30	Springdale, Tennessee[1]
2.1	2.8	4.3	5.1	5.8	6.0	5.4	6.0	8.5	7.2	3.5	2.2	58.9	116.5	30	69	69	71	76	79	84	86	86	86	84	78	72	78	31	Rugby, Tennessee[1]
0.9	3.6	2.2	3.7	5.5	5.5	3.7	5.2	10.2	6.4	2.5	0.9	50.3	88.8															32	Carthage, Tennessee[1]
2.3	2.3	3.3	4.3	6.1	6.2	5.9	7.1	8.7	5.9	2.7	1.6	55.4	124.4	30	68	70	75	79	82	89	92	92	92	86	77	70	81	33	Banners Elk, North Carolina[1]
3.7	2.5	3.8	5.5	7.0	7.7	11.0	13.3	12.8	6.8	2.8	2.0	76.9	166.7	31	65	64	65	68	72	81	84	83	84	80	71	67	73	34	Linville, North Carolina[1,2]
4.4	3.5	5.4	8.5	10.1	9.1	16.0	16.8	8.1	3.0	1.2	87.6	182.8																35	Highlands, North Carolina[1]
2.3	3.7	5.0	6.1	7.7	8.3	9.0	9.6	5.6	2.6	1.6	63.0	119.9	30	72	69	69	73	76	80	83	83	84	81	77	73	77	36	Hendersonville, North Carolina[1]
6.7	5.6	4.9	4.2	6.7	6.1	6.9	9.2	6.7	5.1	8.1	78.9	187.6	10	57	57	58	61	71	77	79	82	81	77	68	61	69	37	Brevard, North Carolina[1,2]
1.5	1.5	4.2	4.7	5.2	5.6	11.9	10.2	11.7	9.5	3.8	1.4	70.2	129.4	3	63	59	66	70	77	81	83	83	87	86	83	73	76	38	Rugby, Tennessee[1,2]
3.1	3.0	2.2	4.2	4.9	7.1	5.2	8.3	10.2	6.7	2.7	0.9	56.5	96.5															39	Marion, North Carolina[1]
2.3	2.0	2.6	3.6	4.8	5.7	5.7	7.9	9.1	6.1	2.2	1.4	52.4	93.2	10	59	59	64	68	75	80	82	84	83	81	75	66	73	40	Brewers, North Carolina[1]
3.3	3.3	3.7	4.1	5.7	6.4	5.2	8.0	11.1	8.2	3.6	1.8	62.4	119.7	18	67	69	70	76	81	84	86	85	86	83	77	71	78	41	Lenoir, North Carolina[1,2]
3.2	3.5	2.7	4.9	6.0	6.5	4.1	7.2	11.7	6.1	2.4	1.2	57.5	102.7															42	Marion, North Carolina[1]
3.0	4.2	5.1	5.9	5.5	6.2	4.7	4.8	8.5	10.1	5.1	3.5	66.6	127.9	10	62	65	70	74	82	88	89	86	83	78	74	69	76	43	Dahlonega, Georgia[1]
2.5	4.1	2.9	5.0	6.0	6.5	4.4	5.9	10.3	9.0	2.6	1.6	59.8	107.3															44	Alpha, Kentucky[1]
4.3	3.3	4.4	4.9	5.1	6.1	4.9	7.1	8.3	8.2	3.9	2.3	60.9	110.6	11	61	64	67	75	81	86	88	85	84	79	72	65	76	45	Riverton, Alabama[1,2]
8.8	6.2	7.0	6.9	8.0	9.2	5.0	5.0	13.1	12.9	6.2	4.4	86.7	166.4															46	Walhalla, South Carolina[1]
3.8	4.2	6.0	5.9	6.7	7.5	5.1	3.5	10.1	8.3	5.5	3.1	67.7	123.2	8	64	66	70	79	83	87	89	87	87	79	74	69	78	47	Oneonta, Alabama[1,2]
3.7	4.2	3.4	4.9	5.6	5.6	4.4	7.4	10.7	10.2	2.7	2.0	62.8	112.2															48	Lynnville, Tennessee[1,2]
2.1	4.6	3.2	5.3	5.2	6.7	2.8	5.6	9.2	9.8	2.7	1.9	59.1	109.4															49	Chimney Rock, North Carolina[1]
2.4	3.1	3.6	4.4	6.3	7.2	8.0	12.1	14.2	9.1	3.6	1.6	74.6	142.6	8	65	67	67	73	79	81	83	83	85	82	74	70	76	50	Rock House, North Carolina[1,3]
3.3	3.0	4.3	5.2	5,9	6.7	5.6	7.1	10.1	7.9	3.5	2.2	63.8	114.7	10	58	58	64	67	73	78	79	79	78	77	72	65	71	51	Roxboro, North Carolina[1,2]
2.4	3.2	4.6	5.2	6.4	8.0	5.9	9.7	10.9	7.2	3.3	2.0	68.8	126.0	17	69	68	70	77	81	84	86	84	85	82	78	73	78	52	Clayton, Georgia[1]
2.1	3.1	4.6	5.7	5.9	6.9	6.1	7.4	10.3	9.0	3.8	2.5	67.4	124.2	10	59	61	67	70	76	81	82	81	81	79	73	66	73	53	Clayton, Georgia[1]
2.9	3.7	5.7	6.8	7.0	7.9	6.7	7.9	10.9	9.1	4.7	2.9	76.2	143.5	36	67	67	71	77	80	85	87	86	85	81	75	68	77	54	Statesville, North Carolina[1,2]
3.2	4.2	4.1	4.3	3.7	4.0	6.0	3.7	6.7	6.1	6.5	6.8	61.3	139.2	18	75	72	69	71	76	82	82	78	77	74	74	76	75	55	Easton, Maryland
3.6	4.2	3.7	2.4	3.1	2.5	4.5	2.1	4.0	5.0	6.4	5.0	47.5	107.9															56	Princess Anne, Maryland[1,2]
3.4	5.1	4.4	4.1	3.6	4.2	6.5	4.3	7.2	6.5	7.8	9.0	70.1	172.6	10	77	74	72	70	75	78	81	77	78	75	74	76	76	57	Lexington, Kentucky[1,2]
5.5	14.8	8.8	4.3	3.9	3.5	5.0	4.5	8.4	8.5	13.1	20.0	112.3	248.5	8	81	80	76	73	75	78	80	78	82	82	80	81	79	58	New Martinsville, West Virginia[1,2]
3.6	7.1	5.8	5.1	4.3	5.6	7.7	5.8	8.1	6.9	8.5	12.3	87.8	216.0	10	87	84	77	74	76	80	82	80	80	80	81	85	81	59	Greensburg, Kentucky[1,2]
3.4	7.6	6.7	6.1	5.6	7.4	8.5	6.3	10.6	8.5	10.9	13.4	102.0	245.0	30	78	76	73	73	75	79	81	79	81	79	77	77	77	60	Beattyville, Kentucky[1,2]
3.4	5.3	3.7	3.7	3.8	2.9	6.1	4.1	10.1	7.1	7.2	7.8	69.2	167.7	7	81	79	73	71	74	80	83	81	80	74	77	80	78	61	Elkhorn, West Virginia[1,2]
4.1	7.9	6.3	5.7	5.6	7.1	7.6	5.7	9.1	6.9	8.7	13.4	95.1	226.7	30	86	84	79	76	76	80	82	81	85	85	85	86	82	62	Nail, Arkansas[1,2]
3.0	6.5	5.1	4.7	4.8	6.5	5.5	5.3	9.4	7.1	6.6	7.9	76.4	164.8															63	Decatur, Tennessee[1,2]
3.5	7.1	6.2	5.4	5.4	6.6	6.3	6.4	9.3	7.2	8.7	12.7	91.8	216.3	28	78	76	73	74	76	80	80	79	81	80	77	78	77	64	Tullahoma, Tennessee[1,2]
3.9	3.3	4.2	4.7	6.2	8.1	8.7	10.4	12.6	7.8	3.7	2.3	73.9	187.6	9	70	72	72	77	82	87	87	87	88	87	76	72	80	65	Nothing comparable within the required latitudes
2.4	2.1	2.9	3.3	3.7	5.0	5.5	7.0	7.8	6.0	2.6	1.7	49.0	88.8	45	65	65	65	68	73	76	79	81	82	81	78	72	74	66	Rugby, Tennessee[1,3]
4.4	2.9	4.6	5.7	5.5	8.7	8.5	5.9	8.5	6.3	3.5	2.7	65.2	137.3	45	67	66	65	66	70	76	78	79	81	81	76	71	73	67	Brevard, North Carolina[1]
3.3	2.7	2.6	4.4	4.9	7.2	8.4	3.9	7.0	5.0	2.7	1.3	52.4	112.0															68	Buckhannon, West Virginia[1]
2.4	1.8	2.8	3.3	3.6	5.4	5.1	4.2	6.1	4.8	2.1	1.5	42.1	90.3	45	70	72	68	64	66	72	75	76	78	79	76	70	72	69	Frostburg, Maryland.
2.2	2.0	2.3	2.6	3.1	4.3	5.5	3.9	5.2	3.7	2.0	2.2	39.0	85.1	45	82	78	73	67	70	73	77	75	79	80	79	83	76	70	Nuttallburg, West Virginia[1]
1.9	1.5	2.9	3.5	4.7	5.6	8.3	5.5	9.1	4.8	2.3	2.0	51.1	120.7	3	70	71	73	76	78	83	88	87	88	87	81	79	80	71	Nothing comparable within the required latitudes
3.7	2.9	5.0	7.0	7.4	10.7	9.3	7.2	9.6	6.5	3.7	2.9	74.9	141.0	30	74	69	67	69	73	77	78	79	79	78	73	75	74	72	Clayton, Georgia[1]
3.0	3.7	4.8	5.4	5.0	7.9	9.4	6.2	9.5	6.2	4.0	4.1	70.2	174.9	27	82	79	65	72	72	77	80	80	81	82	82	84	79	73	Pickens, West Virginia[1,2]
3.3	5.4	4.9	7.2	9.2	12.8	6.9	10.8	13.2	8.7	3.5	2.5	87.4	156.2															74	Caroleen, North Carolina[1,2]
3.7	4.8	6.3	8.3	7.4	12.4	11.0	13.4	13.0	8.8	4.8	3.6	97.5	198.5															75	Rugby, Tennessee[1,2]

[1] Compared with Japanese station, [1] springtime mostly cooler; remainder of year mostly warmer [2] less precipitation [3] more precipitation [4] cooler in summer and autumn

AGRO-CLIMATOLOGICAL CHART OF JAPAN AND ITS NORTH AMERICAN CLIMATIC ANALOGUES —2

(Based upon monthly and annual meteorological data)

Major Island	Prefecture	Shi or Gun	Meteorological Station	Station Ref. No.	Latitude (N.)	Longitude (E.)	Altitude (Feet)	Length of Record (Years)
HONSHŪ	SHIZUOKA	Hamamatsu-shi	HAMAMATSU	76	34°43′	137°43′	100	45
		Takata-gun	ITŌ	77	35°03′	139°04′	....	10
		Kamo-gun	NAGATSURO	78	34°36′	138°51′	194	7
		Ihara-gun	OKITSU	79	35°03′	138°31′	....	10
		Numazu-shi	NUMAZU	80	35°06′	138°51′	24	30
	AICHI	Nagoya-shi	NAGOYA	81	35°10′	136°58′	173	45
	MIE	Kuwana-shi	KUWANA	82	35°04′	136°42′	....	10
		Matsuzaka-shi	MATSUZAKA	83	34°34′	136°32′	....	10
		Shima-gun	TOBA	84	34°28′	136°51′	....	10
		Tsu-shi	TSU	85	34°44′	136°31′	14	45
	SHIGA	Hikone-shi	HIKONE	86	35°16′	136°15′	292	45
		Sakata-gun	IBUKISAN	87	35°25′	136°24′	4514	11
	KYŌTŌ	Ikaruga-gun	AYABE	88	35°18′	135°15′	....	10
		Kyōtō-shi	KYŌTŌ	89	35°01′	135°44′	142	45
		Maizuru-shi	MAIZURU	90	35°29′	135°23′	102	20
		Yosa-gun	MIYAZU	91	35°32′	135°12′	8	45
	ŌSAKA	Osaka-shi	ŌSAKA	92	34°39′	135°26′	10	45
	HYŌGO	Himeji-shi	HIMEJI	93	34°50′	134°41′	....	25
		Kōbe-shi	KŌBE	94	34°41′	135°11′	181	45
		Sumoto-shi	SUMOTO	95	34°21′	134°53′	388	11
		Kinosaki-gun	TOYOOKA	96	35°32′	134°48′	108	12
	NARA	Yoshino-gun	ODAIGAHARAYAMA	97	34°11′	136°06′	5141	3
		Takaichi-gun	YAGI	98	34°31′	135°48′	213	30
	WAKAYAMA	Higashi-muro-gun	HONGŪ	99	33°50′	135°46′	668	9
		Shingū-shi	SHINGŪ	100	33°44′	135°59′	....	9
		Nishi-muro-gun	SHIONOMISAKI	101	33°27′	135°46′	243	17
		Tanabe-shi	TANABE	102	33°44′	135°23′	....	10
		Wakayama-shi	WAKAYAMA	103	34°14′	135°09′	48	45
	TOTTORI	Tōhaku-gun	KURAYOSHI	104	35°29′	133°49′	68	8
		Seihaku-gun	SAKAI	105	35°33′	133°14′	9	8
		Tottori-shi	TOTTORI	106	35°30′	134°14′	....	8
		Yonago-shi	YONAGO	107	35°26′	133°20′	....	10
	SHIMANE	Hamada-shi	HAMADA	108	34°54′	132°04′	65	45
		Matsue-shi	MATSUE	109	35°28′	133°03′	....	25
		Kanoashi-gun	TSUWANO	110	34°28′	131°46′	535	25
	OKAYAMA	Kojima-gun	AJINO	111	34°28′	133°49′	13	29
		Okayama-shi	OKAYAMA	112	34°40′	133°54′	20	45
	HIROSHIMA	Hiroshima-shi	HIROSHIMA	113	34°23′	132°27′	10	45
		Asa-gun	KABE	114	34°31′	132°31′	85	10
		Kure-shi	KURE	115	34°14′	132°34′	93	35
	YAMAGUCHI	Hagi-shi	HAGI	116	34°25′	131°24′	....	10
		Iwakuni-shi	IWAKUNI	117	34°10′	132°11′	....	10
		Shimonoseki-shi	SHIMONOSEKI	119	33°57′	130°58′	158	30
SHIKOKU	TOKUSHIMA	Kaifu-gun	HIWASA	118	33°44′	134°32′	....	10
		Tokushima-shi	TOKUSHIMA	120	34°04′	134°34′	10	45
	KAGAWA	Nakatado-gun	KOTOHIRA	121	34°11′	133°49′	364	10
		Marugame-shi	MARUGAME	122	34°17′	133°49′	....	10
		Nakatado-gun	TADOTSU	123	34°17′	133°46′	17	45
	EHIME	Matsuyama-shi	MATSUYAMA	124	33°50′	132°45′	106	45
		Niihama-shi	NIIHAMA	125	33°57′	133°15′	12	30
		Ochi-gun	SHISAKAJIMA	126	34°06′	133°11′	371	25
		Uma-gun	TŌNARU	127	33°52′	133°18′	62	13
		Uwajima-shi	UWAJIMA	128	33°14′	132°33′	142	7
		Yawatahama-shi	YAWATAHAMA	129	33°27′	132°26′	....	10
	KOCHI	Aki-gun	AKI	130	33°30′	133°54′	....	10
		Hata-gun	ASHIZURIZAKI	131	32°44′	133°01′	213	8
		Kochi-shi	KOCHI	132	33°33′	133°32′	138	30
		Aki-gun	MUROTO	133	33°15′	134°11′	810	9
KYŪSHŪ	FUKUOKA	Fukuoka-shi	FUKUOKA	134	33°25′	130°25′	18	45
		Kurume-shi	KURUME	135	33°19′	130°30′	....	10
	SAGA	Saga-shi	SAGA	136	33°12′	130°18′	41	10
	NAGASAKI	Tsushima-jima, Shimo-agata-gun	IZUHARA	137	34°12′	129°17′	73	10
		Nagasaki-shi	NAGASAKI	138	32°44′	129°52′	340	45
		Sasebo-shi	SASEBO	139	33°10′	128°43′	48	36
		Minami-matsuura-gun	TOMIE	140	32°37′	128°40′	84	5
		Minami-takaki-gun	UNZENDAKE	141	32°44′	130°15′	2814	4
	KUMAMOTO	Kumamoto-shi	KUMAMOTO	142	32°49′	130°42′	128	45
	ŌITA	Ōita-shi	ŌITA	143	33°14′	131°27′	20	45
	MIYAZAKI	Miyakonojō-shi	MIYAKONOJŌ	144	31°43′	131°04′	466	10
		Miyazaki-shi	MIYAZAKI	145	31°55′	131°26′	27	30
	KAGOSHIMA	Kagoshima-shi	KAGOSHIMA	146	31°34′	130°33′	18	45
		Kawanabe-gun	MAKURAZAKI	147	31°16′	130°18′	112	6
RYUKYU IS.	OSHIMA[1]	Ōshima	NAZE	148	28°23′	129°30′	14	30
	ISHIGAKI[1]	Yaeyama-gun	ISHIGAKI	149	24°20′	124°10′	23	30
	OKINAWA	Naha-shi	NAHA	150	26°12′	127°39′	96	30

MEAN TEMPERATURES (° F.)

Station Ref. No.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Annual Range
76	40.8	41.5	47.1	56.3	63.3	70.0	76.8	78.6	73.2	63.7	54.3	45.3	59.4	37.8
77	41.7	43.2	47.1	56.8	62.9	69.6	77.0	79.5	74.5	64.2	55.8	46.9	60.1	37.8
78	45.0	44.4	48.7	57.6	63.3	68.4	75.0	78.3	73.8	65.8	58.6	50.5	60.8	33.8
79	42.3	44.1	48.0	57.4	63.5	70.3	77.5	78.5	74.8	64.8	56.1	46.8	60.4	37.2
80	41.7	43.0	47.8	57.0	63.3	70.0	76.5	78.6	73.4	63.3	54.5	45.9	59.5	36.9
81	37.2	38.3	44.4	54.8	63.1	70.5	77.5	79.5	72.7	61.5	51.1	41.7	57.7	42.3
82	39.2	41.5	45.8	58.7	84.2	72.5	80.6	81.7	75.7	64.4	53.1	43.9	59.8	42.5
83	40.5	41.7	45.3	58.8	84.0	71.6	80.1	81.0	75.2	63.9	54.0	44.8	59.8	40.5
84	41.4	43.0	47.7	57.4	64.8	72.0	80.2	82.0	76.1	65.5	55.4	45.9	60.8	40.6
85	38.0	39.2	44.4	54.0	62.4	70.3	78.1	78.3	72.7	61.9	52.2	43.5	58.1	40.3
86	37.0	37.2	42.4	52.0	60.3	88.7	77.0	78.6	71.8	60.8	50.5	41.9	56.5	41.6
87	18.8	20.7	25.5	38.7	47.5	54.3	62.6	64.0	57.7	46.8	36.5	25.9	41.7	44.1
88	38.8	38.5	43.2	54.8	62.8	70.8	78.8	81.3	73.8	61.7	50.7	41.2	57.9	42.8
89	36.8	37.8	43.5	54.0	62.4	70.3	78.1	79.3	72.3	60.8	50.0	41.0	57.2	42.4
90	37.8	37.8	42.8	53.2	60.4	68.7	76.8	78.1	71.4	60.4	50.4	41.4	56.7	40.3
91	37.8	37.6	42.6	52.7	61.0	68.8	76.8	78.6	71.4	60.6	51.4	42.8	56.8	41.0
92	38.6	38.8	45.5	55.4	63.9	71.4	79.3	81.1	74.3	63.1	52.9	44.1	59.2	41.5
93	38.1	40.3	43.8	55.2	82.6	71.1	78.3	81.3	75.0	63.3	52.2	42.4	58.6	43.2
94	38.6	38.7	45.5	55.6	63.9	70.8	78.3	80.4	73.8	63.5	53.6	44.4	58.2	40.8
95	38.2	39.6	44.6	55.0	63.1	69.6	77.5	80.1	73.4	63.0	53.6	44.6	58.6	40.9
96	35.2	38.0	41.5	52.2	60.3	67.6	77.0	78.3	70.5	58.8	48.6	40.6	55.6	43.1
97	21.2	20.1	29.0	38.7	47.5	54.3	63.0	62.1	56.3	46.9	37.9	29.9	42.3	42.9
98	38.3	38.0	44.1	54.5	62.6	70.9	79.4	79.2	72.0	60.3	50.4	42.1	57.6	40.9
99	41.7	44.8	49.7	58.6	67.5	72.1	79.8	91.3	76.5	64.9	55.2	45.9	61.9	39.6
100	44.2	46.0	49.7	58.3	65.5	70.7	79.0	80.4	76.1	66.6	57.0	47.9	61.7	36.2
101	44.9	45.5	49.5	59.5	64.9	70.3	77.2	79.8	74.7	66.2	59.1	49.6	61.5	34.0
102	42.8	43.7	47.7	59.1	63.1	71.2	79.9	90.9	76.5	95.8	55.9	47.3	61.2	38.0
103	40.6	40.8	46.6	56.3	64.2	71.4	79.0	80.2	73.9	63.1	54.0	45.7	58.5	39.6
104	37.2	38.7	44.4	54.7	63.3	68.5	79.4	91.0	72.7	61.2	51.4	42.9	57.9	43.9
105	38.7	38.7	44.2	53.4	61.3	68.5	77.0	78.0	71.9	61.5	52.3	43.7	57.6	40.3
106	38.7	39.7	45.0	56.7	64.0	70.7	90.1	92.2	74.3	63.5	54.0	44.4	59.4	43.5
107	38.2	39.4	44.4	54.3	61.9	69.8	79.2	90.2	73.9	61.9	52.3	43.5	58.3	41.0
108	41.0	40.8	45.7	53.9	91.2	69.7	76.3	78.3	71.1	61.2	53.6	45.9	59.1	37.5
109	39.6	40.5	44.6	55.2	62.4	70.0	78.8	91.5	74.1	93.0	54.7	43.9	58.9	41.8
110	36.7	39.5	44.9	54.9	82.4	70.0	77.7	78.3	71.2	59.0	40.5	41.4	56.3	42.6
111	40.3	40.3	45.1	55.9	62.6	70.2	77.5	80.1	73.9	63.1	53.1	44.2	58.8	38.8
112	36.5	39.0	44.9	54.7	63.3	71.1	79.0	90.4	73.2	61.7	51.4	42.4	58.3	43.9
113	39.0	39.6	45.3	54.5	63.0	70.3	79.1	90.1	73.0	62.1	51.9	43.2	58.3	41.1
114	37.4	40.6	45.3	54.5	62.8	70.2	75.9	77.8	69.6	57.0	49.7	41.4	59.8	40.5
115	40.9	40.8	45.8	55.9	63.3	70.5	77.9	90.6	73.9	63.1	53.4	44.6	59.2	39.8
116	40.5	41.5	46.4	56.1	93.1	70.2	79.4	80.4	73.4	62.2	55.2	44.9	59.2	39.8
117	40.9	42.3	48.2	56.1	64.4	71.4	79.2	91.5	74.9	64.0	53.6	44.2	59.9	40.7
119	42.1	41.5	48.6	55.2	62.6	69.3	76.5	79.5	73.4	63.9	54.7	46.4	59.4	39.0
118	43.3	45.0	48.7	57.6	65.1	71.8	79.9	90.9	76.5	66.6	56.1	47.7	61.5	37.5
120	40.6	41.0	46.4	56.1	63.9	71.1	78.3	79.9	73.9	63.7	54.1	45.3	58.5	39.3
121	38.3	39.7	44.9	59.3	64.4	71.1	79.7	91.3	74.1	63.1	54.5	43.2	58.0	43.0
122	41.7	42.4	46.2	56.7	64.2	72.0	90.4	92.8	76.3	65.1	55.0	46.2	60.9	41.1
123	41.0	41.0	45.7	54.7	63.0	70.5	78.4	80.6	74.1	63.3	54.1	45.9	59.4	39.6
124	40.3	40.6	46.2	55.2	62.8	70.5	79.4	79.5	73.0	62.4	53.2	45.0	59.0	39.2
125	42.1	41.9	46.4	55.2	63.3	70.5	79.1	80.4	74.1	64.0	54.8	46.6	59.7	38.5
126	41.9	41.5	45.5	54.7	62.4	68.1	76.8	79.3	73.9	64.9	55.2	46.4	59.4	37.9
127	31.6	32.7	39.1	49.9	57.4	63.9	71.2	72.1	65.9	55.2	45.9	36.1	51.6	40.5
128	42.9	42.6	49.4	57.4	64.9	70.5	79.8	90.4	74.3	64.0	55.4	47.7	60.6	37.8
129	42.8	44.6	49.8	60.6	65.1	72.5	80.2	80.6	76.5	66.0	55.8	47.3	61.9	37.8
130	43.5	45.3	48.9	59.4	65.8	71.8	78.1	80.2	76.3	66.4	56.3	47.5	61.5	36.7
131	45.8	46.6	51.8	60.1	67.7	71.2	78.1	80.2	76.1	67.5	58.4	50.7	62.8	34.3
132	41.9	43.0	48.9	58.1	64.6	70.9	77.0	79.0	73.8	63.9	54.1	45.0	60.1	37.1
133	44.1	44.6	48.7	57.9	64.4	68.8	75.9	78.3	73.9	65.3	57.0	49.3	60.6	34.2
134	40.6	41.0	46.8	54.9	63.0	70.5	78.4	79.5	72.1	61.5	62.7	44.8	58.8	38.9
135	41.2	43.5	48.4	58.5	66.0	72.8	81.1	82.8	75.7	64.8	54.1	44.6	61.2	41.6
136	40.5	41.4	47.7	56.8	84.8	72.0	78.2	80.2	73.4	63.0	53.2	44.4	59.7	39.7
137	40.1	40.8	48.8	55.4	62.1	88.7	76.3	78.6	72.1	62.8	53.2	44.4	58.5	38.5
138	41.7	42.1	48.2	56.8	64.0	70.7	78.6	79.5	73.4	64.0	55.0	46.0	59.9	37.8
139	42.4	42.8	48.6	57.6	64.8	71.2	78.4	81.0	74.3	64.6	55.0	46.0	60.6	38.6
140	44.8	43.8	49.8	57.6	64.8	70.3	78.3	80.8	74.8	65.8	57.8	48.6	81.5	36.9
141	32.2	32.7	39.6	49.1	57.0	63.1	70.0	71.2	65.3	55.2	46.6	38.7	51.8	39.0
142	39.8	41.0	48.2	57.6	65.1	72.1	79.2	80.4	73.8	63.0	52.7	43.9	59.7	40.5
143	41.0	41.4	46.6	55.0	62.4	68.6	77.5	78.8	72.7	62.8	53.6	45.3	59.0	37.8
144	41.2	43.5	48.9	58.8	65.8	72.1	77.7	78.5	74.7	64.4	54.0	44.6	60.8	38.3
145	44.4	45.5	51.4	59.7	66.2	72.3	78.6	79.9	74.8	64.9	55.9	47.1	61.7	35.5
146	44.1	45.1	51.1	59.2	68.0	72.1	79.3	80.2	75.2	65.5	56.5	47.8	81.9	36.1
147	46.2	46.4	51.3	58.7	66.8	71.1	79.3	80.4	75.6	66.4	57.7	50.5	62.6	34.2
148	57.7	57.6	61.2	68.9	71.2	77.5	81.3	81.5	78.8	72.9	88.7	80.8	88.4	23.9
149	64.8	63.9	67.6	72.3	76.6	81.0	82.9	82.4	80.4	76.3	71.4	68.2	73.8	19.0
150	61.2	60.6	64.4	68.6	73.8	79.5	82.4	82.0	79.9	75.0	69.4	63.7	71.8	21.8

ABSOLUTE TEMP. (° F.), KILLING FROST AVERAGE DATES, AVERAGE PRECIPITATION (Inches)

Station Ref. No.	Abs. Temp. Max.	Abs. Temp. Min.	Killing Frost Last in Spring	Killing Frost First in Fall	Duration of Average Frostless Season (Days)	Length of Record (Years)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Precipitation Effectivity Index
76	99.0	21.2	Feb. 28	Dec. 7	281	45	0.9	1.8	3.5	4.4	3.5	5.5	5.7	5.5	6.2	5.9	2.6	1.5	47.0	79.0
77	....	....	....	....	....	10	2.2	6.7	5.1	7.3	9.2	11.7	7.8	8.7	15.8	10.7	3.6	2.3	91.3	165.4
78	90.1	27.9	....	....	....	7	1.7	2.4	4.3	4.2	7.2	7.8	4.7	3.5	8.2	5.1	4.2	2.2	55.5	94.8
79	....	....	....	....	....	5	2.5	5.6	5.7	8.5	8.2	8.8	8.8	12.2	14.4	9.7	3.9	2.6	94.1	167.6
80	97.9	17.4	Mar. 24	Nov. 28	249	30	3.4	3.4	5.8	7.3	7.0	8.4	8.2	10.2	11.7	7.8	4.2	3.1	82.6	146.6
81	99.9	13.5	Apr. 12	Nov. 6	207	45	2.0	2.7	4.4	5.8	5.8	8.3	7.0	6.8	8.4	6.7	3.3	2.3	63.7	116.1
82	....	....	....	....	....	25	2.2	2.6	4.3	6.1	7.0	10.1	7.1	7.7	8.3	5.7	2.8	2.3	67.3	116.4
83	....	....	....	....	....	16	1.9	2.6	4.4	6.2	8.2	10.4	7.4	10.0	13.2	8.5	3.4	2.4	76.6	131.7
84	....	....	....	....	....	25	2.7	3.9	6.6	9.1	9.3	12.0	8.7	11.8	16.4	11.3	5.0	3.3	100.1	176.8
85	89.7	18.0	Apr. 9	Nov. 14	218	45	1.6	2.5	4.1	5.6	5.8	8.5	7.2	8.4	11.0	7.8	3.4	2.0	68.9	122.7
86	87.3	11.7	Apr. 22	Nov. 6	197	45	4.6	4.2	4.6	4.8	5.1	8.0	7.2	4.8	7.5	5.6	3.7	4.3	64.5	133.0
87	80.6	2.3	May 5	Oct. 17	164	11	8.4	6.1	5.9	5.3	7.2	8.8	10.8	8.7	10.8	6.1	5.1	8.8	82.1	292.7
88	....	....	....	....	....	25	4.2	4.2	4.8	5.0	5.0	8.1	8.1	6.5	10.0	5.7	3.3	3.8	66.7	137.2
89	98.7	10.6	Apr. 30	Nov. 1	184	45	2.1	2.6	4.0	5.5	5.5	8.3	7.4	5.6	7.6	5.1	3.0	2.1	59.8	110.5
90	89.0	14.5	....	....	....	20	7.8	6.4	5.8	5.0	4.4	8.8	6.3	7.5	8.7	8.2	5.4	7.2	81.1	179.0
91	88.8	11.7	Apr. 19	Nov. 16	210	45	8.3	6.7	5.6	4.9	4.2	6.7	8.1	6.8	8.3	6.7	5.1	8.2	78.7	175.9
92	89.7	18.2	Apr. 9	Nov. 15	218	45	1.6	2.3	3.7	4.8	4.8	7.8	6.0	4.5	6.8	5.2	2.8	1.9	52.2	90.9
93	....	....	....	....	....	25	1.7	2.2	3.7	4.8	5.0	8.8	5.0	5.1	7.1	4.3	2.4	1.5	51.4	90.0
94	98.7	21.6	Mar. 31	Nov. 27	240	45	1.6	2.1	3.4	4.7	4.7	7.6	6.0	5.2	7.0	4.8	2.8	1.8	51.7	88.7
95	97.7	22.6	Mar. 13	Dec. 16	277	11	2.0	3.2	3.7	4.3	6.1	7.8	7.0	5.2	8.5	5.0	3.6	2.4	59.8	106.8
96	99.9	12.4	Apr. 13	Nov. 29	229	12	9.5	7.5	6.1	4.0	4.2	5.5	5.5	5.1	11.1	6.7	5.2	9.6	80.0	159.2
97	90.2	2.1	May 4	Oct. 5	153	3	4.6	4.4	8.5	10.2	11.2	13.7	13.4	57.7	40.1	19.5	10.7	6.2	200.4	400.5
98	99.8	12.0	Apr. 24	Nov. 5	194	30	2.2	2.4	3.8	4.8	4.7	7.9	7.6	4.9	8.6	5.2	3.1	2.2	57.4	104.3
99	....	....	....	....	....	5	2.6	4.0	4.0	9.3	6.6	12.5	14.1	9.1	11.5	9.9	3.9	2.8	98.2	151.3
100	....	....	....	....	....	5	3.2	4.7	5.9	11.3	12.6	17.3	13.0	10.9	21.0	11.6	4.4	4.2	120.1	201.9
101	98.1	25.7	Mar. 18	Dec. 20	275	7	3.0	4.4	6.2	7.9	9.9	13.0	8.7	12.7	13.9	12.7	6.3	4.0	102.5	180.5
102	....	....	....	....	....	25	2.6	2.7	4.7	6.2	6.7	11.3	9.3	7.1	9.7	7.7	3.9	2.8	74.7	127.4
103	100.2	23.2	Mar. 26	Dec. 7	255	45	1.9	2.5	3.8	4.8	4.8	9.2	6.5	5.0	8.0	6.3	3.4	2.3	57.5	89.6
104	....	....	....	....	....	25	6.7	5.3	5.5	3.8	3.8	6.7	5.9	4.3	10.9	6.9	5.2	6.1	71.0	151.3
105	100.0	14.5	Apr. 25	Nov. 12	200	25	7.6	6.5	5.6	4.8	4.2	6.7	6.1	5.2	10.0	6.5	5.9	8.0	77.1	169.0
106	....	....	....	....	....	25	9.9	7.4	6.2	4.5	4.6	6.6	4.8	4.2	9.2	7.1	6.2	9.2	79.0	174.0
107	....	....	....	....	....	25	5.3	4.7	5.0	4.2	4.3	7.1	5.7	5.0	8.9	6.2	4.2	4.9	65.5	124.4
108	99.1	19.8	Apr. 12	Dec. 3	234	45	4.0	3.9	4.5	5.0	4.5	8.0	6.9	4.6	9.9	5.4	4.2	4.5	64.4	123.2
109	....	....	....	....	....	5	5.3	6.3	4.4	4.3	5.2	8.1	6.1	2.6	8.9	7.1	6.8	7.0	72.1	149.5
110	....	....	....	....	....	25	4.2	4.1	5.4	5.2	5.0	10.1	8.3	5.1	8.1	5.4	3.3	4.2	69.4	138.4
111	97.0	21.2	Mar. 31	Nov. 21	234	29	1.6	1.7	3.1	3.7	3.5	6.3	5.1	3.6	6.5	3.8	1.9	1.6	42.4	72.3
112	97.7	17.4	Apr. 17	Nov. 8	205	45	1.3	1.9	3.1	3.7	4.0	6.9	5.2	3.9	6.0	4.0	2.0	1.6	43.3	75.1
113	100.6	16.5	Apr. 9	Nov. 16	221	45	1.8	2.4	4.2	6.1	5.5	10.1	9.3	4.4	7.8	4.5	2.4	2.0	59.4	105.8
114	....	....	....	....	....	5	1.2	3.5	3.0	5.1	5.2	11.3	12.3	2.4	7.6	4.4	2.7	2.0	60.7	109.7
115	99.7	18.2	....	....	....	35	2.1	2.4	4.2	5.5	5.6	8.3	9.3	3.5	6.9	4.0	2.4	2.0	56.3	98.7
116	....	....	....	....	....	25	3.6	4.0	4.2	5.3	4.5	10.3	8.1	4.5	7.6	5.2	3.6	3.5	64.4	119.2
117	....	....	....	....	....	5	2.0	3.7	3.5	6.3	7.3	14.0	8.1	3.3	10.4	4.2	2.9	1.6	67.3	117.5
119	96.6	20.3	Mar. 25	Dec. 2	251	45	2.5	3.1	4.4	5.5	5.4	11.5	9.0	4.9	8.1	4.5	2.9	2.9	64.5	115.2
118	....	....	....	....	....	25	2.7	4.1	6.6	9.9	9.7	12.4	10.4	11.1	12.8	10.5	5.1	3.3	97.6	169.8
120	98.9	22.3	Apr. 9	Nov. 23	229	45	1.5	2.4	3.9	4.9	5.3	7.4	7.3	7.4	10.6	8.1	3.5	2.2	64.3	109.4
121	....	....	....	....	....	5	1.9	3.0	2.9	3.9	5.5	9.9	6.9	3.1	9.4	4.4	3.4	1.8	55.9	97.5
122	....	....	....	....	....	5	1.4	2.2	2.4	3.0	4.4	9.4	5.1	1.9	8.1	3.0	2.9	1.3	45.1	76.5
123	89.2	21.0	Apr. 4	Nov. 26	235	45	1.4	2.0	3.1	3.5	3.9	6.2	5.4	3.8	6.9	4.6	2.4	1.9	45.0	76.0
124	99.9	17.1	Apr. 19	Nov. 12	206	45	1.9	2.3	3.7	4.7	4.8	9.4	7.1	4.4	7.1	4.5	2.8	2.4	54.1	94.8
125	98.6	25.0	Apr. 5	Nov. 22	230	30	1.9	2.0	3.4	3.7	4.2	7.3	7.0	5.7	9.8	5.4	2.7	2.1	55.2	93.2
126	86.8	23.0	Mar. 23	Dec. 30	291	25	1.6	1.8	3.2	3.5	3.7	7.2	5.5	3.7	6.9	3.7	2.1	1.8	44.7	75.9
127	88.2	10.9	Apr. 19	Nov. 12	206	13	2.9	3.9	5.0	5.2	5.4	9.0	12.3	12.5	14.6	7.2	4.1	3.4	85.5	184.9
128	104.4	21.9	Apr. 11	Dec. 3	235	7	2.0	2.6	3.7	5.4	6.1	8.8	6.4	7.9	9.8	3.8	3.8	2.8	63.2	107.1
129	....	....	....	....	....	25	2.2	2.5	3.8	5.3	5.9	10.3	7.5	5.0	7.5	4.6	3.1	2.7	60.4	99.8
130	....	....	....	....	....	25	2.2	2.9	5.3	7.4	8.1	11.5	10.2	8.8	10.3	7.2	3.0	2.5	79.4	133.8
131	92.1	24.1	Mar. 14	Dec. 15	275	8	2.2	4.7	5.5	6.2	9.6	9.6	6.8	8.3	14.0	9.3	6.0	3.0	85.2	143.0
132	98.8	19.4	Mar. 26	Nov. 23	241	30	2.7	3.9	7.4	10.6	10.9	14.0	12.9	13.0	15.9	7.9	4.2	2.8	106.3	189.3
133	89.8	22.5	....	....	....	9	2.7	4.2	6.2	8.6	11.0	12.2	8.5	8.7	13.9	9.9	5.5	3.6	95.0	169.4
134	99.3	17.2	Apr. 20	Nov. 10	203	45	2.5	3.1	4.1	5.1	4.4	10.3	8.2	5.7	8.5	4.4	3.1	3.0	63.4	112.4
135	....	....	....	....	....	25	2.6	3.1	5.0	7.6	6.5	15.4	11.8	5.6	8.2	4.4	2.4	2.2	75.8	128.5
136	98.2	20.3	Apr. 12	Nov. 10	211	25	2.0	2.7	4.6	6.7	6.0	12.6	11.6	6.3	8.6	4.3	2.6	2.2	70.2	121.0
137	98.4	16.5	Mar. 28	Nov. 15	230	25	3.0	3.4	5.0	8.5	7.1	13.5	11.8	9.1	13.4	5.6	3.3	3.1	86.8	158.2
138	98.1	21.9	Mar. 24	Nov. 25	245	45	2.7	3.2	4.8	7.1	6.4	13.0	10.2	6.6	10.9	4.6	3.6	3.1	76.2	133.8
139	101.1	22.8	....	....	....	35	2.8	3.3	5.1	7.3	6.0	13.4	11.4	7.2	9.9	4.3	3.4	3.1	77.3	134.5
140	91.8	28.9	Feb. 13	Dec. 14	303	5	3.3	4.6	4.6	5.9	6.0	11.7	12.0	8.3	12.5	2.7	4.2	5.6	81.4	141.5
141	84.2	14.0	Apr. 15	Oct. 28	195	4	3.7	4.6	6.4	7.6	8.3	21.8	18.9	12.1	12.7	3.3	5.2	5.2	109.8	241.0
142	101.8	15.4	Apr. 11	Nov. 9	211	45	2.2	2.9	4.7	6.3	6.2	13.9	11.7	6.5	6.9	4.3	2.7	2.5	70.8	122.8
143	87.2	18.0	Mar. 30	Dec. 1	245	45	1.6	2.7	4.4	5.2	5.2	9.8	9.4	6.7	9.2	5.7	2.4	1.8	64.1	111.3
144	....	....	....	....	....	25	2.7	3.2	5.9	7.9	7.9	16.9	13.3	10.9	8.8	5.4	3.1	2.2	88.2	152.0
145	99.8	18.5	Mar. 23	Nov. 21	242	30	2.9	4.3	7.5	9.0	9.5	15.5	12.0	11.3	11.7	8.7	5.1	2.8	100.3	173.7
146	97.2	19.9	Mar. 20	Nov. 29	253	30	3.4	4.0	6.4	8.7	8.2	17.0	12.2	7.4	8.7	5.2	3.7	3.4	88.3	153.4
147	95.5	24.3	Mar. 13	Dec. 16	277	6	2.7	4.2	4.6	6.5	8.1	12.3	8.5	5.2	7.4	2.9	4.7	5.5	72.6	124.8
148	95.8	37.6	....	....	....	30	7.9	8.3	8.3	10.3	12.6	16.0	9.7	13.1	10.6	12.0	9.1	6.9	124.8	197.8
149	95.7	42.6	....	....	....	30	5.8	5.1	4.8	5.1	8.0	7.9	8.0	9.3	10.2	9.1	6.8	6.7	86.8	121.9
150	95.0	40.8	....	....	....	30	5.3	5.4	6.1	6.1	8.9	10.0	7.1	10.0	7.1	6.6	5.9	4.3	82.8	119.4

RELATIVE HUMIDITY (%)

Station Ref. No.	Length of Record (Years)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly
76	30	54	53	56	81	67	73	75	73	71	88	63	58	64
77	....	....	....	....	....	....	....	....	....	....	....	....	....	....
78	30	63	83	88	76	81	84	80	87	83	76	70	66	76
79	....	....	....	....	....	....	....	....	....	....	....	....	....	....
80	30	66	65	68	73	76	80	81	78	78	77	73	68	74
81	45	74	72	70	71	75	80	81	81	82	82	78	73	77
82	....	....	....	....	....	....	....	....	....	....	....	....	....	....
83	....	....	....	....	....	....	....	....	....	....	....	....	....	....
84	....	....	....	....	....	....	....	....	....	....	....	....	....	....
85	30	65	68	70	72	75	80	81	82	80	80	76	68	75
86	30	78	78	75	76	77	78	80	78	78	80	78	78	78
87	10	94	82	88	82	84	87	85	83	82	87	89	93	80
88	....	....	....	....	....	....	....	....	....	....	....	....	....	....
89	10	73	73	71	70	70	74	76	76	77	78	78	77	74
90	20	81	80	76	75	76	82	80	80	82	83	81	81	78
91	10	80	79	75	73	75	78	80	78	82	81	80	78	78
92	10	67	70	70	70	71	75	75	75	76	77	76	72	72
93	....	....	....	....	....	....	....	....	....	....	....	....	....	....
94	10	61	65	65	64	68	74	75	73	72	71	68	64	68
95	11	71	72	72	74	78	78	91	78	80	77	76	74	76
96	12	94	93	79	77	79	92	92	82	86	86	82	85	92
97	3	77	75	79	72	90	83	97	99	99	89	92	81	92
98	30	77	75	75	76	76	78	78	80	83	83	81	78	79
99	....	....	....	....	....	....	....	....	....	....	....	....	....	....
100	....	....	....	....	....	....	....	....	....	....	....	....	....	....
101	17	63	66	69	77	90	97	89	88	84	77	71	66	76
102	....	....	....	....	....	....	....	....	....	....	....	....	....	....
103	10	58	91	62	64	66	71	71	71	70	70	68	64	66
104	....	....	....	....	....	....	....	....	....	....	....	....	....	....
105	10	75	74	72	72	76	79	90	90	81	79	76	75	76
106	....	....	....	....	....	....	....	....	....	....	....	....	....	....
107	....	....	....	....	....	....	....	....	....	....	....	....	....	....
108	10	62	64	68	68	75	80	82	90	80	76	69	65	72
109	....	....	....	....	....	....	....	....	....	....	....	....	....	....
110	....	....	....	....	....	....	....	....	....	....	....	....	....	....
111	29	71	71	73	75	75	80	79	76	77	76	72	70	74
112	29	62	63	63	63	65	69	70	69	69	69	89	65	66
113	29	69	71	71	72	76	90	92	79	79	77	76	71	75
114	....	....	....	....	....	....	....	....	....	....	....	....	....	....
115	35	70	68	69	71	73	79	78	75	76	73	73	70	73
116	....	....	....	....	....	....	....	....	....	....	....	....	....	....
117	....	....	....	....	....	....	....	....	....	....	....	....	....	....
119	10	92	65	69	70	76	80	82	79	79	74	71	65	73
118	....	....	....	....	....	....	....	....	....	....	....	....	....	....
120	10	84	68	70	72	76	80	93	81	79	77	73	68	74
121	....	....	....	....	....	....	....	....	....	....	....	....	....	....
122	....	....	....	....	....	....	....	....	....	....	....	....	....	....
123	10	66	68	72	72	75	79	80	79	79	77	73	68	74
124	10	67	70	72	72	74	78	80	79	79	77	74	70	74
125	30	67	67	70	74	74	79	79	76	77	74	71	66	73
126	25	64	65	67	70	72	90	80	77	77	70	67	63	71
127	13	74	76	73	89	71	79	80	81	84	80	76	74	76
128	7	67	68	66	70	76	79	80	77	80	75	73	71	73
129	....	....	....	....	....	....	....	....	....	....	....	....	....	....
130	....	....	....	....	....	....	....	....	....	....	....	....	....	....
131	8	62	64	64	70	78	84	86	83	81	71	68	66	73
132	30	67	66	68	74	77	84	85	82	81	76	74	68	75
133	9	58	60	62	70	77	83	88	85	80	68	64	61	71
134	10	68	71	73	73	77	80	80	81	82	80	76	71	76
135	....	....	....	....	....	....	....	....	....	....	....	....	....	....
136	10	72	72	71	71	75	77	80	78	78	77	76	74	75
137	10	68	71	73	73	77	80	80	81	82	80	86	71	76
138	10	68	68	70	71	76	81	83	80	78	73	71	70	74
139	35	71	68	70	72	73	80	81	76	75	70	71	71	73
140	5	63	63	62	68	74	79	85	78	75	62	64	67	70
141	4	81	78	78	72	77	82	91	90	87	76	76	83	81
142	10	73	72	71	72	75	77	80	78	79	77	77	75	75
143	10	66	70	73	74	78	82	83	83	82	79	76	69	76
144	....	....	....	....	....	....	....	....	....	....	....	....	....	....
145	30	72	71	74	78	79	84	84	84	84	80	78	74	79
146	30	72	72	73	75	77	83	82	80	78	74	74	73	76
147	6	74	72	71	75	78	84	85	82	82	76	76	76	78
148	30	73	73	73	76	77	79	79	80	79	75	73	71	76
149	30	77	77	79	82	82	84	80	81	80	77	76	77	79
150	30	75	75	77	80	82	84	81	82	81	77	76	74	78

Station Reference No.	LATITUDINAL AND YEAR-ROUND THERMAL ANALOGUES (nearest available) WITHIN NORTH AMERICAN REGIONS MOST CLOSELY RESEMBLING THE HIGH PRECIPITATION AND HIGH HUMIDITY AREAS WHICH CHARACTERIZE JAPAN (Based upon similarities in latitudinal positions; in total summations of day-degrees during the growing period and throughout the year; and in trends and characteristics of temperature during the major part of the year.)
76	Mocksville, North Carolina[1]
77	Savannah, Tennessee[1,2]
78	Holland, South Carolina[1]
79	Chattanooga, Tennessee[1,2]
80	Benton, Tennessee[1,2]
81	Marion, North Carolina[1,2]
82	Gainesville, Georgia[1,2]
83	Smithfield, North Carolina[1,2]
84	Edenton, North Carolina[1,2]
85	Clayton, Georgia[1]
86	Andrews, North Carolina[1]
87	Nothing comparable within the required latitudes
88	Clayton, Georgia[1]
89	Tullahoma, Tennessee[1,2]
90	Saxon, North Carolina[1,2]
91	Oak Ridge, North Carolina[1,2]
92	Greenville, South Carolina[1,2]
93	Greenville, South Carolina[1]
94	Greenville, South Carolina[1]
95	Dahlonega, Georgia[1]
96	Rock House, North Carolina[1]
97	Nothing comparable within the required latitudes
98	Tullahoma, Tennessee[1]
99	Hamilton, Alabama[1,2]
100	Pontotoc, Mississippi[1,2]
101	Cordova, Alabama[1,2]
102	St. Bernard, Alabama[1,2]
103	Tryon, North Carolina[1]
104	Oak Ridge, North Carolina[1,2]
105	Roxboro, North Carolina[1,2]
106	Benton, Tennessee[1,2]
107	Carthage, Tennessee[1,2]
108	Dahlonega, Georgia[1]
109	Mocksville, North Carolina[1,2]
110	Brewers, North Carolina[1,2]
111	Hickory, North Carolina[1]
112	Hot Springs, North Carolina[1]
113	Tryon, North Carolina[1]
114	Andrews, North Carolina
115	Greenville, South Carolina[1]
116	Walhalla, South Carolina[1]
117	Spartanburg, South Carolina[1,2]
118	Gainesville, Georgia[1,2]
119	Covington, Georgia[1,2]
120	Dahlonega, Georgia[1]
121	Holly Springs, Mississippi[1,2]
122	Valley Head, Alabama[1,3]
123	Riverton, Alabama[1,3]
124	Gainesville, Georgia[1]
125	Walhalla, South Carolina[1]
126	Clemson College, South Carolina[1,3]
127	Highlands, North Carolina[4]
128	Rome, Georgia[1,2]
129	Athens, Georgia[1,2]
130	Gillsville, Georgia[1,2]
131	Pontotoc, Mississippi[1,2]
132	Ripley, Mississippi[1,2]
133	Atlanta, Georgia[1,2]
134	Diamond, Georgia[1,3]
135	Tallapoosa, Georgia[2]
136	Ramhurst, Georgia[1,2]
137	Dahlonega, Georgia[1,2]
138	Gore, Georgia[2]
139	Lost Mountain, Georgia[1,2]
140	Athens, Georgia[1,2]
141	Parker, North Carolina[2,4]
142	Gainesville, Georgia[2]
143	Diamond, Georgia[1]
144	Florence, Alabama[2]
145	Decatur, Alabama[2]
146	Hamilton, Alabama[2]
147	Rock Mills, Alabama[2]
148	New Smyrna, Florida[2]
149	Fort Pierce, Florida[2]
150	Avon Park, Florida[2]

Compared with Japanese station. [1] springtime mostly cooler; remainder of year mostly warmer [2] less precipitation [3] more precipitation [4] cooler in summer and autumn

AGRO-CLIMATOLOGICAL CHART OF JAPAN

(Based upon monthly

MAJOR ISLAND	PREFECTURE	SHI or GUN	METEOROLOGICAL STATION	Station Ref. No.	Latitude (N.)	Longitude (E.)	Altitude (Feet)	Length of Record (Years)	MEAN TEMPERATURES (° F.) Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly	Annual Range	ABSOLUTE TEMP. (° F.) Max.	Min.	KILLING FROST AVERAGE DATES Last in Spring	First in Fall	Duration of Average Frostless Season (Days)	Length of Record (Years)	Jan.	Feb.	Mar.
HONSHŪ	SHIZUOKA	Hamamatsu-shi	HAMAMATSU	76	34°43′	137°43′	100	45	40.8	41.5	47.1	56.3	63.3	70.0	76.8	78.6	73.2	63.7	54.3	45.3	59.4	37.8	99.0	21.2	Feb. 28	Dec. 7	281	45	0.9	1.8	3.5
		Takata-gun	ITŌ	77	35°03′	139°04′		10	41.7	43.2	47.1	56.8	62.9	69.6	77.0	79.5	74.5	64.2	55.8	46.9	60.1	37.8						10	2.2	6.7	5.1
		Kamo-gun	NAGATSURO	78	34°36′	138°51′	194	7	45.0	44.4	48.7	57.6	63.3	68.4	75.0	78.3	73.9	65.8	58.6	50.5	60.8	33.9	90.1	27.9				7	1.7	2.4	4.3
		Ihara-gun	OKITSU	79	35°03′	138°31′		10	42.3	44.1	48.0	57.4	63.5	70.3	77.5	79.5	74.8	64.9	56.1	46.8	60.4	37.2						5	2.5	5.6	5.7
		Numazu-shi	NUMAZU	80	35°06′	138°51′	24	30	41.7	43.0	47.8	57.0	63.3	70.0	76.5	78.6	73.4	63.3	54.5	45.9	59.5	36.9	97.9	17.4	Mar. 24	Nov. 29	249	30	3.4	3.4	5.8
	AICHI	Nagoya-shi	NAGOYA	81	35°10′	136°58′	173	45	37.2	38.3	44.4	54.9	63.1	70.5	77.5	79.5	72.7	61.5	51.1	41.7	57.7	42.3	99.9	13.5	Apr. 12	Nov. 6	207	45	2.0	2.7	4.4
	MIE	Kuwana-shi	KUWANA	82	35°04′	136°42′		10	39.2	41.5	45.9	56.7	64.2	72.5	80.6	81.7	75.7	64.4	53.1	43.9	59.9	42.5						25	2.2	2.6	4.3
		Matsuzaka-shi	MATSUZAKA	83	34°34′	136°32′		10	40.5	41.7	45.3	56.8	64.0	71.6	80.1	81.0	75.2	63.9	54.0	44.8	59.9	40.5						16	1.9	2.6	4.4
		Shima-gun	TOBA	84	34°29′	136°51′		10	41.4	43.0	47.7	57.4	64.9	72.0	80.2	82.0	76.1	65.5	55.4	45.9	60.8	40.6						25	2.7	3.9	6.6
		Tsu-shi	TSU	85	34°44′	136°31′	14	45	39.0	39.2	44.4	54.0	62.4	70.3	78.1	79.3	72.7	61.9	52.2	43.5	58.1	40.3	99.7	18.0	Apr. 9	Nov. 14	218	45	1.6	2.5	4.1
	SHIGA	Hikone-shi	HIKONE	86	35°16′	136°15′	292	45	37.0	37.2	42.4	52.0	60.3	68.7	77.0	78.6	71.8	60.6	50.5	41.9	56.5	41.6	97.3	11.7	Apr. 22	Nov. 6	197	45	4.6	4.2	4.6
		Sakata-gun	IBUKISAN	87	35°25′	136°24′	4514	11	19.9	20.7	25.5	38.7	47.5	54.3	62.6	64.0	57.7	46.8	36.5	25.9	41.7	44.1	80.6	2.3	May 5	Oct. 17	164	11	8.4	6.1	5.9
	KYŌTŌ	Ikaruga-gun	AYABE	88	35°18′	135°15′		10	39.6	38.5	43.2	54.9	62.6	70.8	78.8	81.3	73.6	61.7	50.7	41.2	57.9	42.8						25	4.2	4.2	4.8
		Kyōtō-shi	KYŌTŌ	89	35°01′	135°44′	142	45	36.9	37.8	43.5	54.0	62.4	70.3	78.1	79.3	72.3	60.8	50.0	41.0	57.2	42.4	99.7	10.6	Apr. 30	Nov. 1	184	45	2.1	2.6	4.0
		Maizuru-shi	MAIZURU	90	35°29′	135°23′	102	20	37.8	37.9	42.8	53.2	60.4	68.7	76.6	78.1	71.4	60.4	50.4	41.4	56.7	40.3	99.0	14.5				20	7.8	6.4	5.9
		Yosa-gun	MIYAZU	91	35°32′	135°12′	9	45	37.9	37.6	42.6	52.7	61.0	68.9	76.8	78.6	71.4	60.6	51.4	42.8	56.8	41.0	98.8	11.7	Apr. 19	Nov. 16	210	45	8.3	6.7	5.6
	ŌSAKA	Osaka-shi	ŌSAKA	92	34°39′	135°26′	10	45	39.6	39.9	45.5	55.4	63.9	71.4	79.3	81.1	74.3	63.1	52.9	44.1	59.2	41.5	99.7	19.2	Apr. 9	Nov. 15	219	45	1.6	2.3	3.7
	HYŌGO	Himeji-shi	HIMEJI	93	34°50′	134°41′		25	38.1	40.3	43.9	55.2	62.6	71.1	79.3	81.3	75.0	63.3	52.2	42.4	58.6	43.2						25	1.7	2.2	3.7
		Kōbe-shi	KŌBE	94	34°41′	135°11′	191	45	39.6	39.7	45.5	55.6	63.9	70.9	78.3	80.4	73.8	63.5	53.6	44.4	59.2	40.8	99.7	21.6	Mar. 31	Nov. 27	240	45	1.6	2.1	3.4
		Sumoto-shi	SUMOTO	95	34°21′	134°53′	368	11	39.2	39.6	44.6	55.0	63.1	69.6	77.5	80.1	73.4	63.0	53.6	44.6	58.6	40.9	97.7	22.6	Mar. 13	Dec. 16	277	11	2.0	3.2	3.7
		Kinosaki-gun	TOYOOKA	96	35°32′	134°49′	108	12	35.2	36.0	41.5	52.2	60.3	67.6	77.0	78.3	70.5	58.8	49.6	40.6	55.6	43.1	98.9	12.4	Apr. 13	Nov. 28	228	12	9.5	7.5	6.1
	NARA	Yoshino-gun	ŌDAIGAHARAYAMA	97	34°11′	136°06′	5141	3	21.2	20.1	28.0	39.7	47.5	54.3	63.0	62.1	56.3	46.8	37.9	29.8	42.3	42.9	80.2	2.1	May 4	Oct. 5	153	3	4.6	4.4	8.5
		Takaichi-gun	YAGI	98	34°31′	135°48′	213	30	38.3	39.0	44.1	54.5	62.6	70.9	78.4	79.2	72.0	60.3	50.4	42.1	57.6	40.9	99.9	12.0	Apr. 24	Nov. 5	194	30	2.2	2.4	3.8
	WAKAYAMA	Higashi-muro-gun	HONGŪ	99	33°50′	135°46′	666	9	41.7	44.6	48.7	58.6	67.5	72.1	78.8	81.3	76.5	64.8	55.2	45.9	61.9	39.6						5	2.6	4.0	4.0
		Shingū-shi	SHINGŪ	100	33°44′	135°59′		9	44.2	46.0	48.7	58.3	65.5	70.7	79.0	80.4	76.1	66.6	57.0	47.8	61.7	36.2						5	3.2	4.7	5.9
		Nishi-muro-gun	SHIONOMISAKI	101	33°27′	135°46′	243	17	44.8	45.5	49.5	58.5	64.6	70.3	77.2	78.8	74.7	66.2	58.1	49.6	61.5	34.0	96.1	25.7	Mar. 19	Dec. 20	275	7	3.0	4.4	6.2
		Tanabe-shi	TANABE	102	33°44′	135°23′		10	42.8	43.7	47.7	58.1	63.1	71.2	79.9	80.8	76.5	65.8	55.9	47.3	61.2	38.0						25	2.6	2.7	4.7
		Wakayama-shi	WAKAYAMA	103	34°14′	135°09′	48	45	40.6	40.8	46.6	56.3	64.2	71.4	79.0	80.2	73.9	63.1	54.0	45.7	59.5	39.6	100.2	23.2	Mar. 26	Dec. 7	255	45	1.9	2.5	3.8
	TOTTORI	Tōhaku-gun	KURAYOSHI	104	35°26′	133°49′	69	8	37.2	38.7	44.4	54.7	63.3	68.5	78.4	81.0	72.7	61.2	51.4	42.8	57.9	43.8						25	6.7	5.3	5.5
		Seihaku-gun	SAKAI	105	35°33′	133°14′	9	8	38.7	38.7	44.2	53.4	61.3	68.5	77.0	79.0	71.8	61.5	52.3	43.7	57.6	40.3	100.0	14.5	Apr. 25	Nov. 12	200	25	7.6	6.5	5.6
		Tottori-shi	TOTTORI	106	35°30′	134°14′		8	38.7	39.7	45.0	56.7	64.0	70.7	80.1	82.2	74.3	63.5	54.0	44.4	59.4	43.5						25	8.9	7.4	6.2
		Yonago-shi	YONAGO	107	35°26′	133°20′		10	39.2	39.4	44.4	54.3	61.9	69.8	79.2	80.2	73.6	61.9	52.3	43.5	58.3	41.0						25	5.3	4.7	5.0
	SHIMANE	Hamada-shi	HAMADA	108	34°54′	132°04′	65	45	41.0	40.8	45.7	53.8	61.2	68.7	76.3	78.3	71.1	61.2	53.6	45.9	58.1	37.5	98.1	19.9	Apr. 12	Dec. 3	234	45	4.0	3.9	4.5
		Matsue-shi	MATSUE	109	35°28′	133°03′		25	39.6	40.5	44.6	55.2	62.4	70.0	78.8	81.5	74.1	63.0	54.7	43.9	58.8	41.9						5	5.3	6.3	4.4
		Kanoashi-gun	TSUWANO	110	34°28′	131°46′	535	25	36.7	38.5	44.6	54.9	62.4	70.0	77.7	79.3	71.2	59.0	49.5	41.4	56.3	42.6						25	4.2	4.1	5.4
	OKAYAMA	Kojima-gun	AJINO	111	34°29′	133°48′	13	29	40.3	40.3	45.1	55.9	62.6	70.2	77.5	80.1	73.9	63.1	53.1	44.2	58.8	39.8	97.0	21.2	Mar. 31	Nov. 21	234	29	1.6	1.7	3.1
		Okayama-shi	OKAYAMA	112	34°40′	133°54′	20	45	36.5	39.0	44.8	54.7	63.3	71.1	79.0	80.4	73.2	61.7	51.4	42.4	58.3	43.9	97.7	17.4	Apr. 17	Nov. 9	205	45	1.3	1.9	3.1
	HIROSHIMA	Hiroshima-shi	HIROSHIMA	113	34°23′	132°27′	10	45	39.0	39.6	45.3	54.5	63.0	70.3	78.1	80.1	73.0	62.1	51.8	43.2	58.3	41.1	100.6	16.5	Apr. 8	Nov. 16	221	45	1.8	2.4	4.2
		Asa-gun	KABE	114	34°31′	132°31′	85	10	37.4	40.6	45.3	54.5	62.8	70.2	75.9	77.9	69.6	57.0	48.7	41.4	56.8	40.5						5	1.2	3.5	3.0
		Kure-shi	KURE	115	34°14′	132°34′	93	35	40.8	40.8	45.9	55.8	63.3	70.5	77.9	80.6	73.8	63.1	53.4	44.6	59.2	39.8	99.7	19.2				35	2.1	2.4	4.2
	YAMAGUCHI	Hagi-shi	HAGI	116	34°25′	131°24′		10	40.5	41.5	46.4	56.1	63.1	70.2	78.4	80.4	73.4	62.2	55.2	44.8	59.2	39.9						25	3.6	4.0	4.2
		Iwakuni-shi	IWAKUNI	117	34°10′	132°11′		10	40.8	42.3	46.2	56.1	64.4	71.4	79.2	81.5	74.8	64.0	53.6	44.2	59.9	40.7						5	2.0	3.7	3.5
		Shimonoseki-shi	SHIMONOSEKI	118	33°57′	130°56′	158	30	42.1	41.5	46.6	55.2	62.6	69.3	76.5	79.5	73.4	63.9	54.7	46.4	59.4	38.0	96.6	20.3	Mar. 25	Dec. 2	251	45	2.5	3.1	4.4
SHIKOKU	TOKUSHIMA	Kaifu-gun	HIWASA	119	33°44′	134°32′		10	43.3	45.0	48.7	57.6	65.1	71.6	78.8	80.8	76.5	66.6	56.1	47.7	61.5	37.5						25	2.7	4.1	6.6
		Tokushima-shi	TOKUSHIMA	120	34°04′	134°34′	10	45	40.6	41.0	46.4	56.1	63.9	71.1	78.3	79.9	73.8	63.7	54.1	45.3	59.5	39.3	98.8	22.3	Apr. 8	Nov. 23	228	45	1.5	2.4	3.8
	KAGAWA	Nakatado-gun	KOTOHIRA	121	34°11′	133°49′	364	10	38.3	39.7	44.6	56.3	64.4	71.1	79.7	81.3	74.1	63.1	54.5	43.2	59.0	43.0						5	1.8	3.0	2.9
		Marugame-shi	MARUGAME	122	34°17′	133°48′		10	41.7	42.4	46.2	56.7	64.2	72.0	80.4	82.8	76.3	65.1	55.0	46.2	60.8	41.1						5	1.4	2.2	2.4
		Nakatado-gun	TADOTSU	123	34°17′	133°46′	17	45	41.0	41.0	45.7	54.7	63.0	70.5	78.4	80.6	74.1	63.3	54.1	45.9	59.4	39.6	98.2	21.0	Apr. 4	Nov. 26	235	45	1.4	2.0	3.1
	EHIME	Matsuyama-shi	MATSUYAMA	124	33°50′	132°45′	106	45	40.3	40.6	46.2	55.2	62.8	70.5	78.4	79.5	73.0	62.4	53.2	45.0	59.0	39.2	98.6	17.1	Apr. 19	Nov. 12	206	45	1.9	2.3	3.7
		Niihama-shi	NIIHAMA	125	33°57′	133°15′	12	30	42.1	41.9	46.4	55.2	63.3	70.5	78.1	80.4	74.1	64.0	54.9	46.6	59.7	38.5	98.6	25.0	Apr. 5	Nov. 22	230	30	1.9	2.0	3.4
		Ochi-gun	SHISAKAJIMA	126	34°06′	133°11′	371	25	41.9	41.5	45.5	54.7	62.4	69.1	76.8	79.3	73.9	64.6	55.2	46.4	59.4	37.8	96.8	23.0	Mar. 23	Dec. 30	281	25	1.6	1.8	3.2
		Uma-gun	TŌNARU	127	33°52′	133°19′	62	13	31.6	32.7	38.1	49.8	57.4	63.9	71.2	72.1	65.8	55.2	45.9	36.1	51.6	40.5	88.2	10.8	Apr. 19	Nov. 12	206	13	2.9	3.9	5.0
		Uwajima-shi	UWAJIMA	128	33°14′	132°33′	142	7	42.8	42.6	48.4	57.4	64.9	70.5	78.8	80.4	74.3	64.0	55.4	47.7	60.6	37.8	104.4	21.9	Apr. 11	Dec. 3	235	7	2.0	2.6	3.7
		Yawatahama-shi	YAWATAHAMA	129	33°27′	132°26′		10	42.8	44.6	49.8	60.6	65.1	72.5	80.2	80.6	76.5	66.0	55.8	47.3	61.9	37.8						25	2.2	2.5	3.8
	KOCHI	Aki-gun	AKI	130	33°30′	133°54′		10	43.5	45.3	48.9	59.4	65.8	71.8	78.1	80.2	76.3	66.4	56.3	47.5	61.5	36.7						25	2.2	2.9	5.3
		Hata-gun	ASHIZURIZAKI	131	32°44′	133°01′	213	8	45.9	46.6	51.8	60.1	67.7	71.2	78.1	80.2	76.1	67.5	59.4	50.7	62.8	34.3	92.1	24.1	Mar. 14	Dec. 15	275	8	2.2	4.7	5.5
		Kochi-shi	KOCHI	132	33°33′	133°32′	138	30	41.9	43.0	48.9	58.1	64.6	70.9	77.0	79.0	73.8	63.9	54.1	45.0	60.1	37.1	98.8	19.4	Mar. 26	Nov. 23	241	30	2.7	3.9	7.4
		Aki-gun	MUROTO	133	33°15′	134°11′	610	9	44.1	44.6	48.7	57.9	64.4	68.9	75.9	78.3	73.9	65.3	57.0	49.3	60.6	34.2	89.8	22.5				9	2.7	4.2	6.2
KYŪSHŪ	FUKUOKA	Fukuoka-shi	FUKUOKA	134	33°25′	130°25′	18	45	40.6	41.0	46.8	54.9	63.0	70.5	78.4	79.5	72.1	61.5	52.7	44.8	58.8	38.9	99.3	17.2	Apr. 20	Nov. 10	203	45	2.5	3.1	4.1
		Kurume-shi	KURUME	135	33°19′	130°30′		10	41.2	43.5	48.4	58.5	66.0	72.9	81.1	82.8	75.7	64.6	54.1	44.6	61.2	41.6						25	2.6	3.1	5.0
	SAGA	Saga-shi	SAGA	136	33°12′	130°18′	41	10	40.5	41.4	47.7	56.8	64.8	72.0	79.2	80.2	73.4	63.0	53.2	44.4	59.7	39.7	98.2	20.3	Apr. 12	Nov. 10	211	25	2.0	2.7	4.6
	NAGASAKI	Tsushima-jima, Shimo-agata-gun	IZUHARA	137	34°12′	129°17′	73	10	40.1	40.8	46.8	55.4	62.1	68.7	76.3	78.6	72.1	62.8	53.2	44.4	58.5	38.5	96.4	16.5	Mar. 29	Nov. 15	230	25	3.0	3.4	5.0
		Nagasaki-shi	NAGASAKI	138	32°44′	129°52′	340	45	41.7	42.1	48.2	56.8	64.0	70.7	78.6	79.5	73.4	64.0	55.0	46.0	59.9	37.8	98.1	21.9	Mar. 24	Nov. 25	245	45	2.7	3.2	4.8
		Sasebo-shi	SASEBO	139	33°10′	129°43′	48	36	42.4	42.8	48.6	57.6	64.6	71.2	78.4	81.0	74.3	64.6	55.0	46.0	60.6	38.6	101.1	22.8				35	2.9	3.3	5.1
		Minami-matsuura-gun	TOMIE	140	32°37′	128°40′	94	5	44.6	43.9	49.8	57.6	64.8	70.3	78.3	80.8	74.8	65.8	57.9	49.6	61.5	36.9	91.8	28.9	Feb. 13	Dec. 14	303	5	3.3	4.6	4.6
		Minami-takaki-gun	UNZENDAKE	141	32°44′	130°15′	2814	4	32.2	32.7	39.6	49.1	57.0	63.1	70.0	71.2	65.3	55.2	46.6	38.7	51.8	39.0	84.2	14.0	Apr. 15	Oct. 28	195	4	3.7	4.6	6.4
	KUMAMOTO	Kumamoto-shi	KUMAMOTO	142	32°49′	130°42′	128	45	39.9	41.0	48.2	57.6	65.1	72.1	79.2	80.4	73.8	63.0	52.7	43.9	59.7	40.5	101.8	15.4	Apr. 11	Nov. 9	211	45	2.2	2.9	4.7
	ŌITA	Ōita-shi	ŌITA	143	33°14′	131°27′	20	45	41.0	41.4	46.6	55.0	62.4	69.6	77.5	78.8	72.7	62.8	53.6	45.3	59.0	37.8	97.2	18.0	Mar. 30	Dec. 1	245	45	1.6	2.7	4.4
	MIYAZAKI	Miyakonojō-shi	MIYAKONOJŌ	144	31°43′	131°04′	466	10	41.2	43.5	48.9	58.8	65.8	72.1	77.7	79.5	74.7	64.4	54.0	44.6	60.6	38.3						25	2.7	3.2	5.9
		Miyazaki-shi	MIYAZAKI	145	31°55′	131°26′	27	30	44.4	45.5	51.4	59.7	66.2	72.3	78.6	79.9	74.8	64.9	55.9	47.1	61.7	35.5	99.9	18.5	Mar. 23	Nov. 21	242	30	2.9	4.3	7.5
	KAGOSHIMA	Kagoshima-shi	KAGOSHIMA	146	31°34′	130°33′	18	45	44.1	45.1	51.1	59.2	66.0	72.1	79.3	80.2	75.2	65.5	56.5	47.8	61.9	36.1	97.2	19.9	Mar. 20	Nov. 29	253	30	3.4	4.0	6.4
		Kawanabe-gun	MAKURAZAKI	147	31°16′	130°18′	112	6	46.2	46.4	51.3	59.7	66.6	71.1	79.3	80.4	75.6	66.4	57.7	50.5	62.6	34.2	95.5	24.3	Mar. 13	Dec. 16	277	6	2.7	4.2	4.6
RYUKYU IS.	OSHIMA	Ōshima	NAZE	148	28°23′	129°30′	14	30	57.7	57.6	61.2	66.9	71.2	77.5	81.3	81.5	78.8	72.9	66.7	60.6	69.4	23.9	95.9	37.6				30	7.9	8.3	8.3
	ISHIGAKI	Yaeyama-gun	ISHIGAKI	149	24°20′	124°10′	23	30	64.6	63.9	67.6	72.3	76.6	81.0	82.9	82.4	80.4	76.3	71.4	66.2	73.8	19.0	95.7	42.6				30	5.8	5.1	4.8
	OKINAWA	Naha-shi	NAHA	150	26°12′	127°39′	96	30	61.2	60.6	64.4	69.6	73.8	79.5	82.4	82.0	79.9	75.0	69.4	63.7	71.8	21.8	95.0	40.8				30	5.3	5.4	6.1

JAPAN AND ITS NORTH AMERICAN CLIMATIC ANALOGUES —2

(Based upon monthly and annual meteorological data)

AVERAGE PRECIPITATION (Inches)													Precipitation Effectivity Index	Length of Record (Years)	RELATIVE HUMIDITY (%)												Station Reference No.	LATITUDINAL AND YEAR-ROUND THERMAL ANALOGUES (nearest available) WITHIN NORTH AMERICAN REGIONS MOST CLOSELY RESEMBLING THE HIGH PRECIPITATION AND HIGH HUMIDITY AREAS WHICH CHARACTERIZE JAPAN (Based upon similarities in latitudinal positions; in total summations of day-degrees during the growing period and throughout the year; and in trends and characteristics of temperature during the major part of the year.)
.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly		
9	1.8	3.5	4.4	3.5	5.5	5.7	5.5	6.2	5.9	2.6	1.5	47.0	79.0	30	54	53	56	61	67	73	75	73	71	68	63	58	64	76	Mocksville, North Carolina[1]
2	6.7	5.1	7.3	9.2	11.7	7.9	8.7	15.9	10.7	3.6	2.3	91.3	165.4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	77	Savannah, Tennessee[1,2]
7	2.4	4.3	4.2	7.2	7.8	4.7	3.5	8.2	5.1	4.2	2.2	55.5	94.8	30	63	63	69	76	81	84	90	87	83	76	70	66	76	78	Holland, South Carolina[1]
5	5.6	5.7	8.5	9.2	9.9	9.9	12.2	14.4	9.7	3.9	2.6	94.1	167.6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	79	Chattanooga, Tennessee[1,2]
4	3.4	5.8	7.3	7.0	9.4	9.2	10.2	11.7	7.9	4.2	3.1	82.6	146.6	30	66	65	68	73	76	80	81	79	79	77	73	68	74	80	Benton, Tennessee[1,2]
0	2.7	4.4	5.8	5.9	8.3	7.0	6.9	8.4	6.7	3.3	2.3	63.7	116.1	45	74	72	70	71	75	80	81	81	82	82	79	73	77	81	Marion, North Carolina[1,2]
2	2.6	4.3	6.1	7.0	10.1	7.1	7.7	9.3	5.7	2.9	2.3	67.3	116.4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	82	Gainesville, Georgia[1,2]
9	2.6	4.4	6.2	6.2	10.4	7.4	10.0	13.2	8.5	3.4	2.4	76.6	131.7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	83	Smithfield, North Carolina[1,2]
7	3.9	6.6	9.1	9.3	12.0	8.7	11.8	16.4	11.3	5.0	3.3	100.1	176.8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	84	Edenton, North Carolina[1,2]
5	2.5	4.1	5.6	5.8	9.5	7.2	8.4	11.0	7.8	3.4	2.0	68.9	122.7	30	65	68	70	72	75	80	81	82	80	80	76	69	75	85	Clayton, Georgia[1]
	4.2	4.6	4.9	5.1	8.0	7.2	4.8	7.5	5.6	3.7	4.3	64.5	133.0	30	79	78	75	75	77	79	80	78	79	80	79	79	78	86	Andrews, North Carolina[1]
	6.1	5.9	5.3	7.2	8.9	10.8	8.7	10.8	6.1	5.1	8.8	92.1	292.7	10	94	92	89	82	84	87	95	93	92	87	89	93	90	87	Nothing comparable within the required latitudes
	4.2	4.8	5.0	5.0	8.1	6.1	6.5	10.0	5.7	3.3	3.8	66.7	137.2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	88	Clayton, Georgia[1]
	2.6	4.0	5.5	5.5	9.3	7.4	5.6	7.6	5.1	3.0	2.1	59.8	110.5	10	73	73	71	70	70	74	76	76	77	78	78	77	74	89	Tullahoma, Tennessee[1,2]
	6.4	5.9	5.0	4.4	6.9	6.3	7.5	9.7	8.2	5.4	7.2	81.1	179.0	20	81	80	76	75	76	82	80	80	82	83	81	81	79	90	Saxon, North Carolina[1,2]
	6.7	5.6	4.9	4.2	6.7	6.1	6.9	9.3	6.7	5.1	8.2	78.7	175.9	10	80	79	75	73	75	78	80	79	82	81	80	79	78	91	Oak Ridge, North Carolina[1,2]
	2.3	3.7	4.8	4.8	7.8	6.0	4.5	6.8	5.2	2.8	1.9	52.2	90.9	10	67	70	70	70	71	75	75	75	76	77	76	72	72	92	Greenville, South Carolina[1,2]
	2.2	3.7	4.6	5.0	8.8	5.0	5.1	7.1	4.3	2.4	1.5	51.4	90.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	93	Greenville, South Carolina[1]
	2.1	3.4	4.7	4.7	7.6	6.0	5.2	7.0	4.8	2.8	1.8	51.7	88.7	10	61	65	65	64	68	74	75	73	72	71	68	64	68	94	Greenville, South Carolina[1]
	3.2	3.7	4.3	6.1	7.8	7.0	5.2	9.5	5.0	3.6	2.4	59.8	106.8	11	71	72	72	74	76	79	81	78	80	77	76	74	76	95	Dahlonega, Georgia[1]
	7.5	6.1	4.0	4.2	5.5	5.5	5.1	11.1	6.7	5.2	9.6	80.0	158.2	12	84	83	78	77	79	82	82	82	86	86	82	85	82	96	Rock House, North Carolina[1]
	4.4	8.5	10.2	11.2	13.7	13.4	57.7	40.1	19.5	10.7	6.2	200.4	400.5	3	77	75	79	72	80	83	87	89	89	89	82	81	82	97	Nothing comparable within the required latitudes
	2.4	3.8	4.8	4.7	7.9	7.6	4.9	8.6	5.2	3.1	2.2	57.4	104.3	30	77	75	75	76	76	78	78	80	83	83	81	78	78	98	Tullahoma, Tennessee[1]
	4.0	4.0	8.3	6.6	12.5	14.1	9.1	11.5	8.8	3.9	2.8	88.2	151.3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	99	Hamilton, Alabama[1,2]
	4.7	5.9	11.3	12.6	17.3	13.0	10.9	21.0	11.6	4.4	4.2	120.1	201.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	100	Pontotoc, Mississippi[1,2]
	4.4	6.2	7.9	9.8	13.0	8.7	12.7	13.8	12.7	6.3	4.0	102.5	180.5	17	63	66	68	77	80	87	89	88	84	77	71	66	76	101	Cordova, Alabama[1,2]
	2.7	4.7	6.2	6.7	11.3	9.3	7.1	9.7	7.7	3.9	2.8	74.7	127.4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	102	St. Bernard, Alabama[1,2]
	2.5	3.8	4.8	4.8	8.2	6.5	5.0	8.0	6.3	3.4	2.3	57.5	99.6	10	59	61	62	64	66	71	71	71	70	70	68	64	66	103	Tryon, North Carolina[1]
	5.3	5.5	3.8	3.8	6.7	5.9	4.3	10.9	6.8	5.2	6.1	71.0	151.3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	104	Oak Ridge, North Carolina[1,2]
	6.5	5.6	4.8	4.2	6.7	6.1	5.2	10.0	6.5	5.9	8.0	77.1	168.0	10	75	74	72	72	76	79	80	80	81	78	76	75	76	105	Roxboro, North Carolina[1,2]
	7.4	6.2	4.5	4.6	6.6	4.9	4.2	9.2	7.1	6.2	9.2	79.0	174.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	106	Benton, Tennessee[1,2]
	4.7	5.0	4.2	4.3	7.1	5.7	5.0	8.9	6.2	4.2	4.9	65.5	124.4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	107	Carthage, Tennessee[1,2]
	3.9	4.5	5.0	4.5	8.0	6.9	4.6	8.9	5.4	4.2	4.5	64.4	123.2	10	62	64	66	68	75	80	82	80	80	76	69	65	72	108	Dahlonega, Georgia[1]
	6.3	4.4	4.3	5.2	8.1	6.1	2.6	8.8	7.1	6.9	7.0	72.1	148.5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	109	Mocksville, North Carolina[1,2]
	4.1	5.4	5.2	5.0	10.1	9.3	5.1	8.1	5.4	3.3	4.2	69.4	138.4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	110	Brewers, North Carolina[1,2]
	1.7	3.1	3.7	3.5	6.3	5.1	3.6	6.5	3.8	1.9	1.6	42.4	72.3	29	71	71	73	75	75	80	79	76	77	76	72	70	74	111	Hickory, North Carolina[1]
	1.9	3.1	3.7	4.0	6.6	5.2	3.9	6.0	4.0	2.0	1.6	43.3	75.1	29	62	63	63	63	65	68	70	69	69	69	69	65	66	112	Hot Springs, North Carolina[1]
	2.4	4.2	6.1	5.5	10.1	8.3	4.4	7.9	4.5	2.4	2.0	59.4	105.8	29	69	71	71	72	76	80	82	79	79	77	76	71	75	113	Tryon, North Carolina[1]
	3.5	3.0	5.1	5.2	11.3	12.3	2.4	7.6	4.4	2.7	2.0	60.7	109.7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	114	Andrews, North Carolina
	2.4	4.2	5.5	5.6	9.3	8.3	3.5	6.9	4.0	2.4	2.0	56.3	98.7	35	70	68	69	71	73	78	78	75	76	73	73	70	73	115	Greenville, South Carolina[1]
	4.0	4.2	5.3	4.5	10.3	8.1	4.5	7.6	5.2	3.6	3.5	64.4	119.2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	116	Walhalla, South Carolina[1]
	3.7	3.5	6.3	7.3	14.0	8.1	3.3	10.4	4.2	2.9	1.6	67.3	117.5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	117	Spartanburg, South Carolina[1,2]
	3.1	4.4	5.5	5.4	11.5	9.0	4.8	8.1	4.5	2.8	2.9	64.5	115.2	10	62	65	69	70	76	80	82	79	78	74	71	65	73	118	Gainesville, Georgia[1,2]
	4.1	6.6	9.8	8.7	12.4	10.4	11.1	12.9	10.5	5.1	3.3	97.6	169.8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	119	Covington, Georgia[1,2]
	2.4	3.8	4.8	5.3	7.4	7.3	7.4	10.6	8.1	3.5	2.2	64.3	108.4	10	64	68	70	72	76	80	83	81	79	77	73	68	74	120	Dahlonega, Georgia[1]
	3.0	2.9	3.9	5.5	9.8	6.9	3.1	9.4	4.4	3.4	1.8	55.9	97.5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	121	Holly Springs, Mississippi[1,2]
	2.2	2.4	3.0	4.4	9.4	5.1	1.9	8.1	3.0	2.9	1.3	45.1	76.5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	122	Valley Head, Alabama[1,3]
	2.0	3.1	3.5	3.8	6.2	5.4	3.9	6.9	4.6	2.4	1.8	45.0	76.0	10	66	69	72	72	75	79	80	79	78	77	73	69	74	123	Riverton, Alabama[1,3]
	2.3	3.7	4.7	4.8	8.4	7.1	4.4	7.1	4.5	2.8	2.4	54.1	94.8	10	67	70	72	72	74	78	80	78	79	77	74	70	74	124	Gainesville, Georgia[1]
	2.0	3.4	3.7	4.2	7.3	7.0	5.7	9.8	5.4	2.7	2.1	55.2	93.2	30	67	67	70	74	74	79	79	76	77	74	71	66	73	125	Walhalla, South Carolina[1]
	1.8	3.2	3.5	3.7	7.2	5.5	3.7	6.9	3.7	2.1	1.8	44.7	75.8	25	64	65	67	70	72	80	80	77	77	70	67	63	71	126	Clemson College, South Carolina[1,3]
	3.9	5.0	5.2	5.4	9.0	12.3	12.5	14.6	7.2	4.1	3.4	85.5	184.9	13	74	76	73	69	71	79	80	81	84	80	76	74	76	127	Highlands, North Carolina[4]
	2.6	3.7	5.4	6.1	8.8	6.4	7.9	9.8	3.9	3.8	2.8	63.2	107.1	7	67	68	66	70	76	79	80	77	80	75	73	71	73	128	Rome, Georgia[1,2]
	2.5	3.8	5.3	5.9	10.3	7.5	5.0	7.5	4.6	3.1	2.7	60.4	99.8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	129	Athens, Georgia[1,2]
	2.9	5.3	7.4	8.1	11.5	10.2	8.8	10.3	7.2	3.0	2.5	79.4	133.8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	130	Gillsville, Georgia[1,2]
	4.7	5.5	6.2	9.6	9.6	6.8	8.3	14.0	9.3	6.0	3.0	85.2	143.0	8	62	64	64	70	78	84	86	83	81	71	68	66	73	131	Pontotoc, Mississippi[1,2]
	3.9	7.4	10.6	10.9	14.0	12.9	13.0	15.9	7.9	4.2	2.9	106.3	189.3	30	67	66	68	74	77	84	85	82	81	76	74	69	75	132	Ripley, Mississippi[1,2]
	4.2	6.2	8.6	11.0	12.2	8.5	8.7	13.9	9.9	5.5	3.6	95.0	169.4	9	58	60	62	70	77	83	88	85	80	68	64	61	71	133	Atlanta, Georgia[1,2]
	3.1	4.1	5.1	4.4	10.3	9.2	5.7	8.5	4.4	3.1	3.0	63.4	112.4	10	68	71	73	73	77	80	80	81	82	80	76	71	76	134	Diamond, Georgia[1,3]
	3.1	5.0	7.6	6.5	15.4	11.8	5.6	9.2	4.4	2.4	2.2	75.8	128.5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	135	Tallapoosa, Georgia[2]
	2.7	4.6	6.7	6.0	12.6	11.6	6.3	8.6	4.3	2.6	2.2	70.2	121.0	10	72	72	71	71	75	77	80	79	79	77	76	74	75	136	Ramhurst, Georgia[1,2]
	3.4	5.0	8.5	7.1	13.5	11.8	9.1	13.4	5.6	3.3	3.1	86.8	158.2	10	68	71	73	73	77	80	80	81	82	80	86	71	76	137	Dahlonega, Georgia[1,2]
	3.2	4.8	7.1	6.4	13.0	10.2	6.6	10.9	4.6	3.6	3.1	76.2	133.8	10	68	68	70	71	76	81	83	80	78	73	71	70	74	138	Gore, Georgia[2]
	3.3	5.1	7.3	6.0	13.4	11.4	7.2	9.9	4.3	3.4	3.1	77.3	134.5	35	71	69	70	72	73	80	81	76	75	70	71	71	73	139	Lost Mountain, Georgia[1,2]
	4.6	4.6	5.9	6.0	11.7	12.0	8.3	12.5	2.7	4.2	5.6	81.4	141.5	5	63	63	62	68	74	79	85	78	75	62	64	67	70	140	Athens, Georgia[1,2]
	4.6	6.4	7.6	8.3	21.8	18.9	12.1	12.7	3.3	5.2	5.2	109.8	241.0	4	81	79	78	72	77	82	91	90	87	76	76	83	81	141	Parker, North Carolina[2,4]
	2.9	4.7	6.3	6.2	13.9	11.7	6.5	6.9	4.3	2.7	2.5	70.8	122.8	10	73	72	71	72	75	77	80	78	79	77	77	75	75	142	Gainesville, Georgia[2]
	2.7	4.4	5.2	5.2	9.8	9.4	6.7	9.2	5.7	2.4	1.8	64.1	111.3	10	66	70	73	74	78	82	83	83	82	79	76	69	76	143	Diamond, Georgia[1]
	3.2	5.9	7.9	7.9	16.9	13.3	10.9	8.8	5.4	3.1	2.2	88.2	152.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	144	Florence, Alabama[2]
	4.3	7.5	9.0	9.5	15.5	12.0	11.3	11.7	8.7	5.1	2.8	100.3	173.7	30	72	71	74	78	79	84	84	84	84	80	78	74	79	145	Decatur, Alabama[2]
	4.0	6.4	8.7	8.2	17.0	12.2	7.4	8.7	5.2	3.7	3.4	88.3	153.4	30	72	72	73	75	77	83	82	80	79	74	74	73	76	146	Hamilton, Alabama[2]
	4.2	4.6	6.5	8.1	12.3	8.5	5.2	7.4	2.9	4.7	5.5	72.6	124.8	6	74	72	71	75	79	84	85	82	82	76	76	76	78	147	Rock Mills, Alabama[2]
	8.3	8.3	10.3	12.6	16.0	9.7	13.1	10.6	12.0	9.1	6.9	124.8	197.9	30	73	73	73	76	77	79	79	80	79	75	73	71	76	148	New Smyrna, Florida[2]
	5.1	4.8	5.1	8.0	7.9	8.0	9.3	10.2	9.1	6.8	6.7	86.8	121.9	30	77	77	79	82	82	84	80	81	80	77	76	77	79	149	Fort Pierce, Florida[2]
	5.4	6.1	6.1	8.9	10.0	7.1	10.0	7.1	6.6	5.9	4.3	82.8	119.4	30	75	75	77	80	82	84	81	82	81	77	76	74	79	150	Avon Park, Florida[2]

Compared with Japanese station, [1] springtime mostly cooler; remainder of year mostly warmer [2] less precipitation [3] more precipitation [4] cooler in summer and autumn


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